Cooler Master CM 690 II Advanced | AMD Phenom II X2 555 BE | Nvidia Optimus

A Sandhills Publication

# CPU®

## COMPUTER POWER USER

THERMALTAKE LEVEL 10
PAGE 30

TRIPLE-CHANNEL DDR3, CLOCKED & OVERCLOCKED
PAGE 20

THE SOUNDS OF WAR: TEN HEADSETS REVIEWED
PAGE 15

ACTUALLY VIRTUAL: BRING VIRTUALIZATION HOME
PAGE 76

## HOST YOUR OWN LAN PARTY

BUILD YOUR GAME PLAN WITH TIPS FROM THE PROS
PAGE 54

WE GO WITH THE FLOW
PAGE 46

April • Vol. 10 Iss. 04

$5.99 U.S. • $7.99 Canada

Q&A WITH GREG NIELSON
SANDIA LABS' LEAD RESEARCHER'S SUNNY DISPOSITION
PAGE 110

msi™

Supports intel CORE i3 inside
Supports intel CORE i5 inside
Supports intel CORE i7 inside
intel Chipset inside INTEL® P55 Intelligent performance

DOUBLE YOUR POWER

BY MSI MULTI-GPU TECHNOLOGY

BIG BANG

FUZION

DESIGNED FOR THE EXTREME GAMER

HYDRA TECHNOLOGY

Hydra Engine creates a multi-GPU environment that it is not a 'mission impossible' anymore to install one graphics card with ATI's GPU and another with NVIDIA's in the same system. As well as image processing and physical operation can be utilized properly and flexibly.

us.msi.com

CPU®
COMPUTER POWER USER

April 2010 • Vol 10 Issue 04

## SPOTLIGHT

58 **Host Your Own LAN**
Expert Tips For Building Your Game Plan

60 **The Right Stuff**
The Essential LAN Checklist

64 **Some Assembly Required**
How To Structure Your LAN Infrastructure

68 **Follow The Money**
How To Play (& Win) The LAN Numbers Game

## Frontside

7 **What's Happening**
12 **Digital Economy**

## Heavy Gear

14 **Dream Hardware**
15 **For Your Ears Only**
Experience The Sound & Fury Of Our Horde Of Headsets
20 **Paving The Way For Gulftown**
A Quintet Of Triple-Channel DDR3 Kits, Clocked & Overclocked
26 Ballistic Sentinel XK
27 Gyration Air Mouse Elite
Zalman MS1000-HS2
28 Tech NPS HP-750-G14C
Silverstone SUGO SG04-FH
30 Mountain Mods H2gO Aluminum Cube
Thermaltake Level 10
31 AMD Phenom II X2 555 Black Edition & AMD Athlon II X2 255
32 Zalman Z7 Plus
Gigabyte 890GPA-UD3H
33 Antec ISK300-150
Cooler Master CM 690 II Advanced
36 NZXT Hades
Zalman CNPS10X Performa
37 **Nvidia Optimus**
The Way It's Meant To Be Switched
38 **AMD ATI Radeon HD 5670, 5570 & 5450**
Cypress Has Triplets

Copyright 2010 by Sandhills Publishing Company. *Computer Power User* is a trademark of Sandhills Publishing Company. All rights reserved. Reproduction of material appearing in *Computer Power User* is strictly prohibited without written permission. Printed in the U.S.A. GST # 123482788RT0001 (ISSN 1536-7568) *CPU Computer Power User* USPS 020-801 is published monthly for $29 per year by Sandhills Publishing Company, 131 West Grand Drive, P.O. Box 82667, Lincoln, NE 68501. Subscriber Services: (800) 424-7900. Periodicals postage paid at Lincoln, NE. POSTMASTER: Send address changes to *Computer Power User*, P.O. Box 82545, Lincoln, NE 68501.

Did you find the hidden *CPU* logo on our cover? Turn the page for the answer.

## Hard Hat Area

PC Modder

42 **Silicon Shenanigans**
April Fool's Mods For Mischievous Power Users
46 **Mad Reader Mod**
Flow

48 **Advanced Q&A Corner**
51 **X-ray Vision: Intel Wireless Display**
Mirror Video Between Your Laptop & HDTV
54 **White Paper: Nvidia Tegra 2**
Second-Generation SoC Aims To Drive Mobile Market

## Infinite Loop

Strange stats and other odd-ball items from computing's periphery. **pages 96, 99**

## Loading Zone

73 **The Bleeding Edge Of Software**
Inside The World Of Betas
74 **Up To Speed**
Upgrades That'll Keep You Humming Along
76 **Virtualization For The Rest Of Us**
Out Of The Enterprise & Into The Home
80 LapLink PC Mover Professional
LapLink SafeErase 4.1
81 **Open Sores**
Mobile Apps Get WAC-ed

## Digital Living

84 **Coming Soon To A TV Near You**
Web Video Makes The Move To Your Other Screen
88 **The Department Of Stuff**
backward.txt
89 **At Your Leisure**
PC & Console Games & Gear
94 **The Cutting Edge**
The Rise Of VisiCalc

## Tips & Tricks

95 **Software Tips & Projects**
Windows Multimedia DVD Creation On The Cheap
98 **Warm Up To Penguins**
Multimedia According To Linux

## What's Cooking

100 **Shavings From The Rumour Mill**
Heaven Save Us From 1,000 iPad Clones
101 **Technically Speaking**
An Interview With McAfee's Dave Marcus
104 **Under Development**
A Peek At What's Brewing In The Laboratory

## Back Door

110 **Q&A With Greg Nielson**
Sandia Labs' Lead Researcher's Sunny Disposition

## EDITOR'S NOTE

We spent quite a few pages this month on the subject of how you can put together your own LAN party. Not the kind where five or six guys from your WoW guild show up and plunk their PCs on your dining room table; we're talking the kind of events you actually have to *plan* for. I know—it's a little scary when your gaming habit progresses to the point where you have to organize things and even market them.

But the LAN scene is huge and getting bigger all the time, and while we realize that not everyone who reads *CPU* is a LAN fanatic, the cross-section of PC enthusiasts you find at these events is quite simply fascinating. It hasn't been that long since mainstream America thought of LANs as the new teen slumber party format, and there's probably still plenty of that sentiment out there, but that's because those people haven't been to a LAN. Sure, there are some young guns going to these things, but attendance these days crosses pretty much every demographic boundary. The result at events like this is a really interesting blend of folks, and they're there for lots of reasons.

True, gaming is the glue that sort of holds the whole LAN concept together, and there's plenty of it at any event you choose to attend. Late-night tournaments pitting teams of gamers against each other in the latest FPS are probably the most visible manifestation, but the truth is that at the best of these events, the people are the real draw.

Just ask Matt Conwell, master and commander of PDXLAN in Portland, who was kind enough to share some of his expertise with us this month (see "The Right Stuff" on page 60). Ask Matt how long his incredible run would have lasted if PDX was just about gaming. If you've been to PDX or a LAN like it, you probably notice that a substantial portion of the attendees spend as much time (or even more, in some cases) away from their computers as they do cappin' fools who don't know what time it is.

In retrospect, we may not have spent enough time on this subject, but take my word for it, a LAN that facilitates a sense of community and fun off-screen as well as on is a LAN that will last, and all else being equal, prosper. We travel to a lot of LANs in the course of our work, but there are some out there that we would travel halfway across the country to attend on our own dime if we had to, and that is a far stronger response than even Modern Warfare 2 could elicit.

So read up, and if you're inspired to launch your own event, make sure you save us a seat on the aisle.

**Chris Trumble, Publication Editor, *CPU***

Sandhills Publishing

**Customer Service**
(For questions about your subscription or
to place an order or change an address.)
customer-service@cpumag.com
Toll Free: (800) 733-3809
Fax: (402) 479-2193

To make a payment
***Computer Power User***
P.O. Box 85673
Lincoln, NE 68501-9507

General inquiries
***Computer Power User***
P.O. Box 82545
Lincoln, NE 68501-9507

**Hours**
Mon. - Fri.: 7 a.m. to 8 p.m. (CST)
Sat.: 8 a.m. to 4 p.m. (CST)
Online Customer Service & Subscription
Center
www.cpumag.com

**Web Services**
(For questions about our Web site.)
webhelp@cpumag.com
(800) 733-3809

**Authorization For Reprints**
Toll Free: (800) 247-4880
Fax: (402) 479-2193

**Editorial Staff**
editor@cpumag.com
Fax: (402) 479-2104
131 W. Grand Drive
Lincoln, NE 68521

**Subscription Renewals**
(800) 382-4552
Fax: (402) 479-2193
www.cpumag.com

**Advertising Staff**
Toll Free: (800) 247-4880
Fax: (402) 479-2193
131 W. Grand Drive
Lincoln, NE 68521

Gotcha.
Here it is.

PATRIOT

Connect. Share. Play.

Valkyrie | Box Office | Gear Box

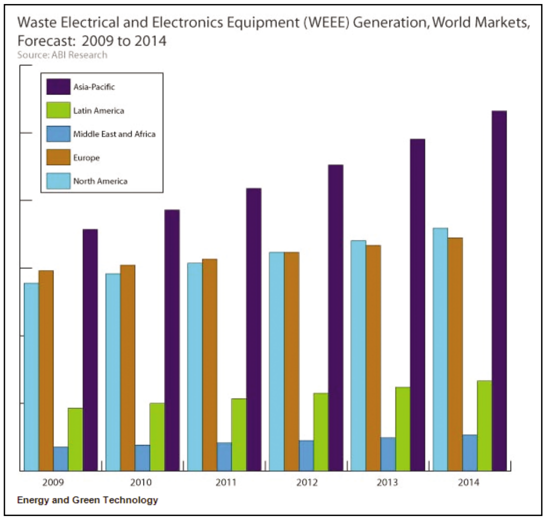
When it comes to digital living, Patriot has the solutions for you. From our Box Office all-in-one digital media player to our Valkyrie & Gear Box NAS solutions, sharing digital content like movies, music and photos is a snap.

newegg.com | Fry's Electronics | Memory Express | Buy.com | NCIX.com | Circuit City.com

amazon.com | Canada Computers www.canadacomputers.com | TigerDirect.com | CompUSA.com | Micro Center computers & electronics

www.patriotmemory.com

Compiled by Blaine Flamig


Waste Electrical and Electronics Equipment (WEEE) Generation, World Markets, Forecast: 2009 to 2014

Source: ABI Research

## E-waste = Revenue

On one hand, ABI Research reasons that e-waste can pose a "massive threat to the world's ecosystem" that could result in contaminating the environment and exposing humans and other life-forms to health hazards. On the other hand, "if treated properly, much e-waste may be reclaimed or recycled for future use and converted into a significant new revenue stream." How significant? According to its recent "e-Waste Recovery and Recycling" study, ABI Research predicts the global e-waste recovery market will rise from $5.7 billion in 2009 to about $14.7 billion by 2014's end. That's a 20.8% CAGR (compound average growth rate) if you're keeping score at home. ▲

## A Crack In The Chip

The security-minded TPM chip working in your PC, Xbox 360, cable set-top box, and other gear isn't as crack-proof as once believed. At the recent Black Hat DC Conference, Christopher Tarnovsky, security researcher and owner of Flylogic Engineering, detailed the process he used to crack an Infineon SLE 66 CL PE chip, of which he described to the Associated Press as being "mean, man; it's like a ticking time bomb if you don't do something right." Note to would-be crackers pondering using Tarnovsky's technique to get at data TPM chips aim to protect: Tarnovsky's method required six months' prep time; physical access to the chip; and using acid to dissolve the chip's outer shell, rust remover to get to the chip's cores, needles to hijack programming instructions occurring at the chip level, and an electronic microscope costing upward of $70,000 to focus on the task at hand. ▲

## Kaspersky Eyes Hardware To Battle Rootkits

Kaspersky Lab recently secured Patent No. 7,657,941 from the U.S. Patent and Trademark Office. Why care? Because the patent concerns a "hardware-based antivirus system that effectively combats rootkits." Developed by Kaspersky's Oleg Zaitsev, the device would install between a hard drive and CPU and RAM, connecting to the system bus or integrating into the drive controller. The device would then allow or block the writing of data to the drive. "Antivirus solutions and malware are both types of software with similar rights," stated Zaitsev. "This is where a hardware-based antivirus solution has a distinct advantage over conventional AV solutions because it monitors all attempts to access a memory device while remaining inaccessible to malware. This is critical for fighting such sophisticated threats as rootkits and bootkits." Zaitsev adds that the hardware AV solution seamlessly integrates with other security solutions, server software, and specialized computers. ▲

## Creative Aims To Wow WoW Enthusiasts

Want to "experience the sounds of Azeroth and beyond like never before?" Then temporarily log yourself out of your current WoW session and preorder Creative Technology's new Sound Blaster World of Warcraft Headset. Creative revealed a prototype of the headset last year at BlizzCon but reportedly will only release a limited number of the headsets. The wireless model is available for preorder at Amazon.com for $159.99, while the wired model will run $119.99. Beyond the included THX TruStudio PC technology, buyers can expect PC and Mac support, custom WoW-themed voices to drop on fellow players, and two sets of LED-enabled headset lenses decked out in Horde and Alliance artwork. ▲

# HARDWARE MOLE

## No Ghosts In This SideWinder

What do PC gamers request most? Better in-game control, says Microsoft. Thus Microsoft's new SideWinder X4 Keyboard ($59.95), which boasts "the industry's most advanced antighosting technology." Microsoft states that technology ensures complex key combos "will be recognized by the computer to keep the game in action." Developed by Microsoft's Applied Sciences Group, the board's antighosting prowess supports up to 26 keys pressed simultaneously. There's also the macro recording feature and the new auto macro repetition tool that lets you press one key to continually repeat a macro. Logitech's new 2.4GHz Wireless Desktop MK710 combo ($99), meanwhile, doesn't offer up much gaming-wise but does offer plenty of faithful service nonetheless via three-year rated battery life for the mouse and keyboard. An integrated LCD on the keyboard details that battery life as well as the status of the CAP, SCROLL, and NUM LOCK keys. ▲

## Want Reliability? Buy A Mac

There's plenty to crow about at Apple these days, and not just about the iPad. Beyond ranking third behind L.L.Bean and USAA in *BusinessWeek*'s fourth annual Customer Service Champs survey, Apple finished first in Rescuecom's Annual 2010 Computer Reliability Report. Although "Asus was definitely the manufacturer to watch in 2009" due to its "skyrocketing market shipment percentage and a lopsidedly low number of computer support calls," Apple topped Asus, Lenovo, Toshiba, and HP overall. Rescuecom ranked Apple first by measuring its 8% U.S. computer market share against the just 2.2% of computer support calls Rescuecom received that were related to Apple systems. *BusinessWeek*, meanwhile, gave Apple A+ scores for quality of staff and efficiency of service. Further, 66% of the 1,000 people BusinessWeek surveyed indicated they'd definitely recommend Apple, and 58% stated they'd purchase from Apple again. ▲

Courtesy of Apple

## LG Electronics Bringing OLED TVs Stateside

Normally, we don't go ga-ga for televisions in this space, but anyone who's witnessed firsthand the excellence emitting from an OLED TV screen will understand our enthusiasm concerning word that LG will not only release the 15-inch EL9500 OLED set stateside by mid-2010 but also a 20-inch OLED model this year. Better, Tech-On reports that LG is planning a 30-inch model for a 2011 release and a 40-inch set for 2012. "They may be expensive, but it will be possible to buy a 40-inch class OLED TV in 2012," Tech-On quoted Won Kim, LG VP of OLED Sales and Marketing. To date, only Sony has released a consumer OLED TV, the roughly 2-year-old 11.1-inch XEL-1, which tops the $2,000 mark and has been in very limited supply. The EL9500 is already selling in South Korea, reportedly sporting a 1,366 x 768 resolution, 100,000:1 contrast ratio, and 100Hz refresh rate. ▲

Compiled by Blaine Flamig

## Will You Pay?

So, if the gravy train that is free online news, television, radio, games, and more runs dry and content owners start charging, will you pay? Nielsen asked 27,000 buyers in 52 countries just that for its "Changing Models: A Global Perspective on Paying for Content Online" report. "The answer is a definite 'maybe.'" Consumers are most likely to pay for theatrical movies and music (nearly 60%), followed by games (about 51%), professionally produced video (50%), magazines (49%), newspapers (42%), Web-only news (35%), music via radio (32%), and social communities (28%). They're less likely to pay for "content that is essentially homegrown online," such as podcasts, user-created videos, and blogs. ▲

## FCC Targets 100Mbps

FCC Chairman Julius Genachowski wants 100 million U.S. households rigged with broadband access capable of at least 100Mbps speeds by 2020. Genachowski detailed his ambitions in late February, roughly a month before the FCC was to present Congress with a National Broadband Plan. An FCC survey of approximately 5,000 people found that nearly 35% of U.S. citizens don't have in-home broadband access, with 36% of that total believing access is still too expensive and 19% not seeing the Internet being personally relevant. Further, 65% of non-broadband users stated there's too much offensive material lurking about online, 57% fear their data is at risk, and 46% feel the Web is a threat to their children. Overall, the FCC found 22% of adults don't use the Internet whatsoever. ▲

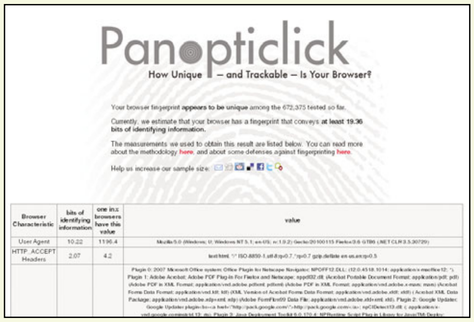
## Comcast Enters Online Storage Biz

Comcast is enticing its Internet customers to entrust their digital belongings to the company's new Secure Backup & Share online backup service. Powered by online storage provider Mozy, Secure Backup & Share gives all Comcast high-speed Internet subscribers 2GB of free online storage; 50GB runs $4.99 monthly or $49.99 yearly, while 200GB is $9.99 monthly or $99.99 yearly. Subscribers also get personal Web space from which to share files with others. Mac support is still coming, but support for various mobile devices is included. As Gizmodo.com reports, however, one caveat is that Comcast has confirmed the 200GB plan will count against the 250GB monthly cap Comcast previously placed on data subscribers. ▲

## SITE SEEING

### Panopticlick Wants Your Fingerprint

As the Electronic Frontier Foundation puts it, "Traditionally, people assume they can prevent a Web site from identifying them by disabling cookies on their Web browser. Unfortunately, this is not the whole story." In fact, Web sites can use bits of data garnered from an OS, browser, plug-ins, system fonts, and more to create a "fingerprint" that could help identify you and your system. Thus, the EFF has started the Panopticlick project in which it's anonymously logging users' identifying data for comparison against others' fingerprints. The result is an overall uniqueness score that indicates how identifiable you are on the Web. Of roughly 670,000 fingerprints already gathered, Panopticlick judged our fingerprint as being unique, although our system did convey "at least 19.35 bits of identifying information," including browser version, plug-in, time zone, screen size, color depth, system font, and HTTP Accept header information. ▲


Panopticlick
How Unique — and Trackable — Is Your Browser?
Help us increase our sample size:

Your browser fingerprint **appears to be unique** among the 672,375 tested so far.

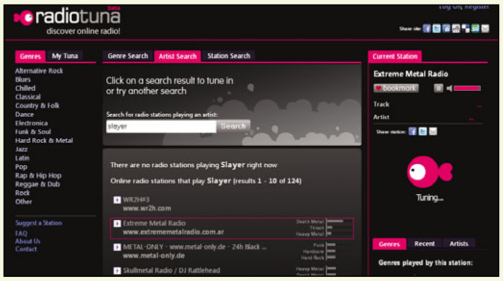
Currently, we estimate that your browser has a fingerprint that conveys **at least 19.36 bits of identifying information.**

The measurements we used to obtain this result are listed below. You can read more about the methodology here, and about some defenses against fingerprinting here.

| Browser Characteristic | bits of identifying information | one in x browsers have this value | value |
|---|---|---|---|
| User Agent | 10.22 | 1196.4 | Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.9.2) Gecko/20100115 Firefox/3.6 GTB6 (.NET CLR 3.5.30729) |
| HTTP_ACCEPT Headers | 2.07 | 4.2 | text/html, */* ISO-8859-1,utf-8;q=0.7,*;q=0.7 gzip,deflate en-us,en;q=0.5 |

### Internet Radio A Tuna Can Love

Combine the shared frustration of three enterprising music fans to easily find new Internet radio stations, and what do you get? The impetus to create RadioTuna, "the first real-time search engine for online radio." Search for, say, Bob Dylan at RadioTuna, and the site will not only show you stations currently playing Dylan tunes, but also connects you directly. If no stations are spinning Dylan records, RadioTuna suggests those most likely to. Still in beta, RadioTuna lets you search by artist, genre, and station, as well as bookmark favorite stations for access from anywhere. But why Internet radio in the first place? Because the combined catalogue of "thousands of real people" and experts is "effectively unlimited," RadioTuna states. Already, RadioTuna claims it has counted "over 10 million unique" Internet radio tracks, and "we still can't identify everything that gets played." ▲



Click on a search result to tune in or try another search

Search for radio stations playing an artist: slayer

There are no radio stations playing **Slayer** right now

Online radio stations that play **Slayer** (results 1 - 10 of 124)

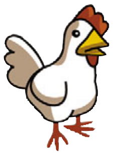
- WR2H#3 www.wr2h.com
- Extreme Metal Radio www.extrememetalradio.com.ar
- METAL-ONLY - www.metal-only.de - 24h Black ... www.metal-only.de
- Skullmetal Radio / DJ Rattlehead

Genres played by this station:

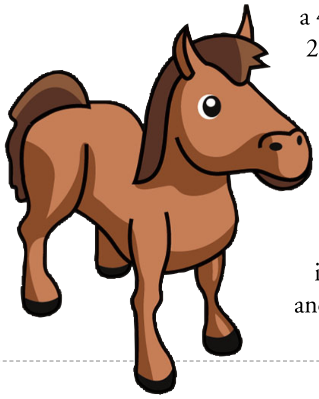
Compiled by Blaine Flamig

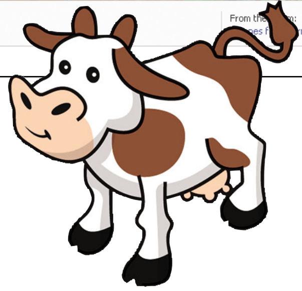
## The Great Gaming Migration

FarmVille's Photos - Scenes from FarmVille
Photo 15 of 20 | Back to Album | FarmVille's Photos | FarmVille's Profile
Previous Next
Added June 19, 2009 · Comment · Like



So, just exactly who are all these "social gamers" taking to social networking sites to till the soil in FarmVille and whack their enemies in Mafia Wars? According to a survey that PopCap Games recently conducted of nearly 5,000 U.S. and UK residents, the average social gamer is a 43-year-old woman. Overall, 24% of those surveyed reported playing social-based games regularly; PopCap projects out to a social gaming population numbering 100 million people in the States and UK alone. PopCap states the social gaming market is expected to rake in $1 billion this year, which makes sense considering PopCap's survey indicated 95% of social gamers play multiple times weekly and 64% at least once daily. ▲





## Windows 7 Pushes Vista Down The Mountain

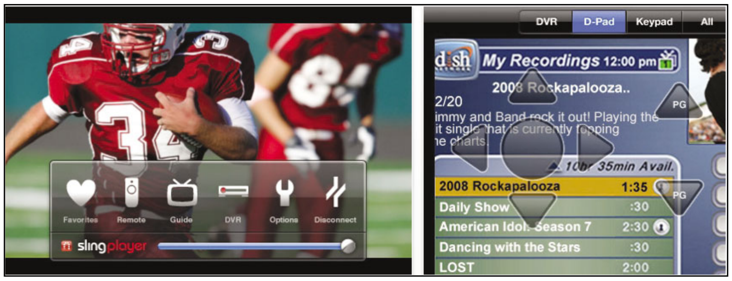
The big winner in the January 2010 version of Valve's monthly survey focusing on what computer hardware Steam customers are using is the 64-bit version of Win7, which despite still being only months old topped Windows Vista 32-bit for the first time by a 19.5% to 19.09% count. Win7's percentage represents a 3.89% gain vs. Vista 32-bit's 1.62% slide. Despite losing 2.62% of its share, the 32-bit version of Windows XP remains the most popular OS among Steam users at 42.15%. Win7, Vista 64-bit, and WinXP 64-bit claimed 9.03%, 8.82%, and 0.63% stakes, respectively. Elsewhere, Intel (69.06%) topped AMD (30.94%) for processor use among Steam users, while Nvidia (65.01%) bested ATI (29.82%) in video card use. ▲

## Cloud Computing Passes The Criminal Viability Test

How does Rik Ferguson, Trend Micro's senior security advisor, know that cloud computing is a viable platform? Because criminals have adopted it. Ferguson stated as much at the recent Westminster eForum, saying criminals "are the people who are leading-edge adopters of technology that is going to work and going to stick around for a long time." Criminals are already using Google and Amazon.com cloud services to operate command-and-control services for botnets, Ferguson states, as well as to spew spam and host phishing sites. Thus, companies should rethink their use of traditional outside-in methods to detect suspicious behavior in favor of those factoring in that "criminals are trying very hard to lose themselves and their activities in the general white noise of the Internet." ▲

# SOFTWARE SHORTS

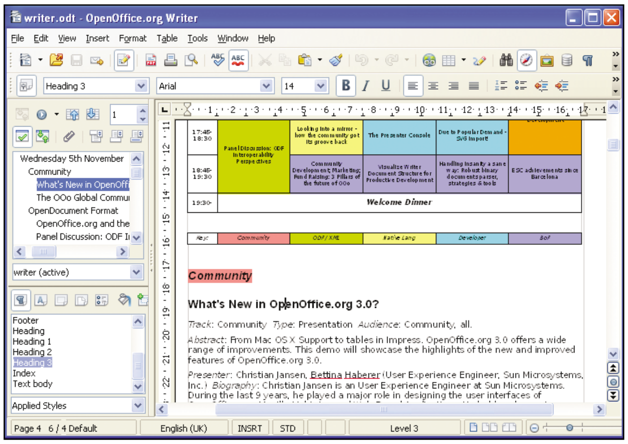
## SlingPlayer Mobile App Finally Gets Its 3G Badge



It wasn't without some controversy, but AT&T finally gave Sling Media's SlingPlayer Mobile App ($29.99) its approval in early February to use the carrier's 3G network. The app has been available since spring 2009, though only with official support for use with AT&T's Wi-Fi hotspots, as AT&T reasoned the app was a potential bandwidth hog and could overload its 3G network. As keen observers pointed out, however, AT&T has allowed some partners, including MLB.com, to stream content on the 3G network. At press time, version 1.2 of SlingPlayer Mobile was available in the App Store for SlingBox Solo, Pro, or Pro-HD owners. ▲

## OpenOffice.org By The Millions

If it's been awhile since you've paid attention to OpenOffice.org, here's what you've missed. In mid-February, the organization turned version 3.2 of its free office suite loose. Since version 3.0 was released roughly a year ago, OpenOffice.org states the app has been downloaded 100 million times from its Web site. Over OpenOffice.org's nearly 10-year history, there have been 300 million downloads of the suite total. Beyond speedier startups, 3.2 touts better compatibility with ODF and proprietary file formats, numerous enhancements to the suite's Calc component, new charts, and added PostScript-based OpenType fonts. As for the competition, Microsoft released what was described as a "near-ready" version of Office 2010 to select testers in its Technology Adoption Program in mid-February ahead of a scheduled official June release in 32- and 64-bit versions. ▲



Community

What's New in OpenOffice.org 3.0?

*Track*: Community *Type*: Presentation *Audience*: Community, all.

*Abstract*: From Mac OS X Support to tables in Impress. OpenOffice.org 3.0 offers a wide range of improvements. This demo will showcase the highlights of the new and improved features of OpenOffice.org 3.0.

*Presenter*: Christian Jansen, Bettina Haberer (User Experience Engineer, Sun Microsystems, Inc.) *Biography*: Christian Jansen is an User Experience Engineer at Sun Microsystems. During the last 9 years, he played a major role in designing the user interfaces of

## The Signs Of Email Addiction

"Hello, my name is Bob, and I'm an email-aholic." OK, so email-recovery support groups aren't likely to pop up anytime soon, but if numbers related to a recent study that Neverfail commissioned Osterman Research to conduct are accurate, there's reason for concern. Of those surveyed, 95% admit to checking business-related email away from work, 78% while in the loo, and 11% during an "intimate moment." "As email has become integrated into mission-critical business processes, employees are feeling extraordinary pressure to be constantly available," stated Michael Osterman, Osterman Research president. So available that 85% reported an email outage of even an hour would impact their workflow. Elsewhere, 94% admitted checking business email in the evening and 93% on weekends, while 79% tote their business-related mobile devices while on vacation, 20% at weddings, 30% at graduations, and 15% at funerals. ▲

## Job Of The Month

If you own an Xbox 360, a PlayStation 3, or a Roku Netflix Player, then you already know that the DVD rental giant Netflix is starting to stream thousands of on-demand films directly to TVs. But the company won't stop there; Netflix says in its job posting for a Director of Product Management – Streaming Devices: "We want to get to every screen a consumer uses as quickly as possible." This high-level manager needs to lead the teams that will develop applications that put Netflix movies on the next generation of Internet-enabled TVs, game consoles, set-top boxes, and Blu-ray players. You will work with all arms of the Netflix outreach to all consumer electronics devices, from engineers and customer support to marketing and business development. Most of all, the company wants applicants who have a passion for the changing media landscape. "A huge shift in how consumers access content is underway," the listing reads. "You want to be part of defining that shift."

## Companies Are Not Facebook-Ready

Does your organization have a formal policy regarding employee use of external social networks such as Facebook, Twitter, and LinkedIn?

### Global

Yes: 20% | No: 75% | Unsure: 5%

| Americas | Europe/Middle East/Africa | Asia Pacific |
|---|---|---|
| Yes: 29% | Yes: 11% | Yes: 25% |
| No: 69% | No: 87% | No: 61% |
| Unsure: 2% | Unsure: 2% | Unsure: 14% |

(Manpower, Inc. Employer Perspective on Social Networking Survey, 2009)

## The Graying Of The Blog

Once the exclusive purview of uninhibited teen diarists, the online blog is growing up . . . and turning a little gray. According to the latest Pew Internet & American Life study of youth and their use of social media, only 14% of teens say they blog, down substantially from 28% in 2006. Conversely, in 2007 only 7% of users over the age of 30 blogged, whereas 11% of the 30-plus crowd blog now. But it isn't as if teens suddenly stopped talking about themselves, oh no. Their focus has moved to social networks, where use among this group has catapulted to 73% from 55% in late 2006.

## IT Job Market Reboots

After months of contraction, the number of new jobs in IT increased by 12,900 positions in January. The 0.3% improvement reverses a loss of 200,000 jobs in the sector since November 2008, according to IT services company TechServe Alliance. Overall, however, tech workers have fared much better than the national averages. According to the IEE-USA, the unemployment rate for software engineers, for instance, is down to 4.1%.

## Raw Numbers

### 2009 In Review

▶ 25.6%

Percent of world population with access to the Internet (360 million people)

Internet World Stats

▶ 233,848,493

Number of sites on the Internet in Dec. 2009

Netcraft

▶ 247 billion

Average number of daily emails sent worldwide in 2009

Radicati

▶ 27.3 million+

Average number of Tweets posted per day, Oct. 21 through Nov. 11, 2009

Pingdom

▶ 148,000

Number of zombie computers created by malware intrusions each day

McAfee

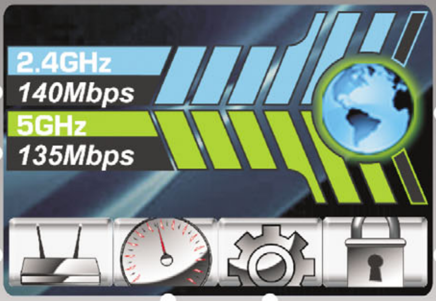
# Winning Performance

300Mbps Concurrent Dual Band Wireless N Gigabit Router
TEW-673GRU

**TRENDnet IP Camera Contest**

**Submit Your Video at www.trendnet.com**
Enter Code CPU to Double Your Prizes

## Color Management Interface



Real Time 2.4GHz and 5GHz Wireless Throughput

Device Information: General, Internet, Wireless, and Wired

Real Time Performance: 2.4GHz, 5GHz, Wired, and Internet Connection

Internet Connection

Security: Current PIN and WPS Connection

Device Settings: Restart, Reset, Day/Time, and Connected Devices

TRENDnet®

©2010 TRENDnet All rights reserved

amazon.com Buy.com J&R MICRO CENTER The Ultimate Computer Store NCIX.com PROVANTAGE newegg.com TigerDirect.com

# DREAM HARDWARE

After an arctic winter we couldn't quite hibernate through, our sole dream is to get outside and do stuff. Indoor tech need not apply. Hey, that's what this issue's other 109 pages are for.

**by Marty Sems**

## Trexa

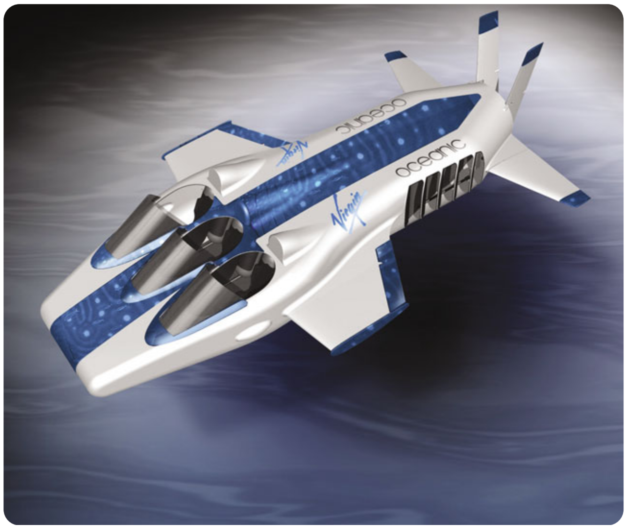
The trend toward electric supercars is commendable, yet it could prove problematic for the marketing of future car flicks. Hollywood would have to take the thunder out of a reboot of "Thunder Road." And what of other classics? "Silenced Bullitt"? "Two-Decibel Blacktop"? Sigh. Well, in any case, we're still giddy at the prospect of this DIY plug-in electric platform. The Trexa ($15,999; www.trexa.com) lets you roll your own kit car on a lithium iron phosphate foundation. Add your own lightweight body, fuzzy dice, and whatnot, and you'll have a cruiser with a range of up to 125 miles. Four hours of 240V power later, you'll have topped up the two-speed's 28kWh max capacity. Plan on some suspension tuning, however; the longest available wheelbase is shorter than a Mini Cooper's. The Trexa should start creeping into driveways next year. ▲

## AMATOYA

Liam Ferguson dreams of fire. AMATOYA (tinyurl.com/ybv7vnt) is just a glint in his eye thus far, but the fire reconnaissance vehicle concept has already won him a student design award in his native Australia. As if the sharks and poisonous critters of the continent nation don't give all the Bruces and Sheilas enough to contend with, some of the most settled areas are also some of the most combustible, being loaded with wind-dried vegetation, eucalyptus trees, and eucalyptus-stuffed koalas. Key to civilian and firefighter safety in a fast-moving bushfire is swift intelligence about where the fire is going. Not only could AMATOYA scout the perimeter of the blaze in safety—thanks to features such as military ceramic paint and aerogel-laminated windows—it can also use a remote-controlled, water-conserving, pulse-style IFEX Technologies fire suppression cannon as necessary. Hot-cha. ▲

## DeepFlight Merlin

Longtime readers know exactly what we'll do when our proverbial ship comes in. We're gonna take that sucker *down*. We've kept our periscope trained on Hawkes Ocean Technologies (www.deepflight.com) for nearly a decade now. The siren song of its DeepFlight submersibles beckons us to founder upon the rocks of our financial reality. Perhaps the 15-foot baby of the family is more affordable. Packing lithium phosphate power and air tanks for its SCUBA-clad passengers' face masks, the Merlin can hit 5 knots and cruise for up to five hours. There's a HUD for the open cockpits, electronic position beacons for tracking by a support yacht (not included), and a FAN-C flight and navigation computer to keep depth and rates of ascent/descent from harming the passengers with abrupt pressure changes. The debutante of the line, titillatingly named Necker Nymph, went to the guy who runs Virgin Group. He'll rent her out for 25 grand a week. ▲



# For Your Ears Only

## Experience The Sound & Fury Of Our Horde Of Headsets

Talking is almost as essential to gaming today as breathing. Whether you need to coordinate with your team or trash your victims, you need a headset that can perform anywhere from a quiet office to a chaotic gaming conference. We trotted out the tunes, flicks, and games to put a pile of headsets through the wringer.

Unlike some reviews, we didn't pick one setting to use on all equipment. Rather, we used a Creative SoundBlaster X-Fi Titanium on our test platform and worked to tweak our favored settings to get the best quality out of each product.

### Creative Sound Blaster Arena Surround

Although some have criticized the Arena's white plastic body as feeling cheap (it does), the benefit is a light weight that makes this one of the most comfortable sets we reviewed for long-term wear. The pleather is soft and comfortable (although nonreplaceable), ear fit is snug but pleasant, and balance/pressure across the head is excellent, even for those with a relatively large head. There's a removable mic boom, and the inline control features a Mic On/Off switch, volume control, and an illuminated ring to show you if the mic is enabled.

With a 40% Crystalizer setting, some custom EQ work, and a push in the bass management of Creative's Console UI, the results were very good, especially on the lows. The Arena's highs, although satisfactory, fail to really impress. Every once in a while, we heard the slight sound level warble common with artificial 3D post-processing, but it was easy to miss. Creative's drivers include a Silencer function, which aims to squash background noise, but we found it to be so-so. It definitely cuts down on noise, although not to the point of elimination, and it leaves you sounding somewhat metallic and filtered. Mic clarity was superb if you don't mind a slight bit of what sounds like reverb in your conversations.

In gaming, we found that the Arena excels in making a very wide sound field with excellent lateral distinction, but its front/back simulation is fairly vague. Put it in perspective, though. For $99, this is a very comfortable headset with excellent voice quality and decent fidelity.

### Creative Sound Blaster World Of Warcraft Wireless Headset

Let's agree that the multi-illuminated, pulsing, semicustomizable cans and rampant WoW theming on these headphones has about $20 to $30 of "cool" value. Is a headset with excellent fidelity, wireless connectivity, and some slick post-processing worth essentially $130? We think so.

First, the bad news: Stand under an air vent and you'll find that Creative's mic is extremely sensitive to airflow, which explains why the semiflexible and detachable boom keeps the mic so far from your mouth. (Neverthless, voice clarity is excellent, and the mic dampens ambient noise very well.) Headband tension is strong enough that we had to relieve our ears from the leatherette pressure every 30 minutes or so. And normal 2.4GHz caveats apply here as our Logitech wireless speakers clobbered this device. More worrisome is that while we found the WoW headset stunning for gaming and movies, some bizarre software conflict repeatedly reduced iTunes and WMP playback into a stuttering disaster. This didn't appear in the Arena set. The two volume control buttons on the left can are handy but could use either auditory or tactile cues to help you with up/down adjustments.

Creative skinned its normal Console into a WoW theme and added some excellent perks. Dialog Plus boosts mids and voices in games, which is handy for hearing people with quiet or poor headsets, and Smart Volume can help elevate normally quiet sounds, but you don't want either skewing your usual media. Creative's highs are crisp without becoming shrill, and the bass is rich and full. Set your manual EQ properly and you won't have to overdo things with the Bass slider. Again, the surround effects might be better called "surround-ish," but lateral separation and clarity is good enough that we didn't care. The lithium-ion batteries charge via mini-USB, even during play, and will run for up to nine hours.

WoW fans will go nuts for this set, and deservedly so. General headset users will

**Sound Blaster Arena Surround**
$99.99
Creative
www.creative.com

Specs: Frequency: 20 to 20,000Hz (headphones), 80 to 16,000Hz (mic); Impedance: 32 ohms (headphones), <2.2K ohms (mic); Sensitivity: 105dB; Cord length: 8 ft.

**Sound Blaster World of Warcraft Wireless Headset**
$159.99
Creative
www.creative.com

Specs: Frequency: 20 to 20,000Hz (headphones), 100 - 7,000Hz (mic); Impedance: 32 ohms (headphones), 2.2K ohms (mic); SPL: 112dB; Mic sensitivity: -48 dbV/Pa; Wireless: 2.4GHz

**G35**
$129.99
Logitech
www.logitech.com

**Specs**: Frequency: 20 to 20,000Hz (headphones), 100 to 10,000Hz (mic); Impedance: 32 ohm (headphones), 2.2K ohm (mic); Cable: 10 ft.; Mic sensitivity: -42dB

**GameCom 777**
$109.95
Plantronics
www.plantronics.com

**Specs:** Frequency: 20 to 20,000Hz (headphones), 100 to 8,000Hz (mic); Cable: 6.5 ft.

love the fidelity and mic quality; just beware of shaky drivers and the air-sensitive mic.

## Logitech G35

Ask 10 listeners about simulated surround, and you'll get 10 different perceptions. Everyone listens for different cues. So when we say that Logitech's G35 gave the best simulated sound experience of any set in this roundup, we have to qualify things. Invariably, we found that setting content for 5.1/7.1 output was superior to selecting stereo output and letting Logitech's drivers "Dolby-fy" the stream. This is why music inevitably suffered with Dolby surround added. You need to start with a true surround stream.

But, given that starting point, which sounds better—Dolby 7.1 processed or not? We perceived slightly better front/back spatiality with driver surround enabled. Also, we found that as sound sources passed from one ear to the other they tended to "jump" from one ear to the other, particularly when behind the listener. Adding Dolby really smoothed out these jumps and provided a "bigger"-feeling sound stage. The tradeoff is clarity. Speakers directly in front of you lack that "in your face" presence because they sound spread out. The sound of a blade plunging into a body sounds much sharper, more metallic and squishy, with the Dolby disabled. You'll need to experiment and see which you prefer for a given type of content.

All that said, yes, the G35s remain amazing. They do what any two-speaker headset can do for sound reproduction, and they do it incredibly well. Logitech's drivers only offer sliders for volume, bass, treble, and microphone, the last three of which we often left maxed out. The resulting sound was excellent—crisp, deep, full, and never overdone. With movies and mic sensitivity, we wished for higher level capabilities, but what you get is sufficient. Without Dolby, music sounded outstanding. Microphone range and noise isolation are average for this group, but the G35's heavier can build does help cut out more ambient noise than an open-air design.

From its heavy, braided cord to the three semiprogrammable macro buttons (Logitech needs to make these compatible with any app on the system, not just the few on its pull-down menus) to the brilliant volume roller on the left can, the G35 has by far the best on-headset controls in this roundup. Yes, this set is heavier than most, but with the smaller band pad inserted, the G35 remained comfortable for at least a couple of hours of constant wear.

Audiophiles at heart, we found the G35 fairly priced, feature-rich, and still one of the best headset options in production for enthusiasts.

## Plantronics GameCom 777

If we judged the 777 on audio quality alone, it would've been among the best of the best. For example, in our music tests, we went from a 50% bass setting with some trance music into an 85% bass setting (on top of our standard custom EQ profile) to fill out Mozart's Symphony #40, and the 777 responded gorgeously, never showing so much as a flutter in the lows. Mids are full and precise, and treble soars without screeching. This left us with some of the best spatial representation in this roundup—forget so-called surround. In fact, the 777 includes a Dolby USB dongle into which you can plug the standard 3.5mm stereo/mic jacks. We tried the dongle for about 20 minutes in several apps and finally ditched it, preferring the added dynamics of Creative's X-Fi drivers over whatever nominal (and slightly dampened) psychoacoustic expansion Dolby was offering. It truly is hard to make a lot out of a little.

Sadly, Plantronics pays less attention to its microphone, which delivers mostly clear sound but a bit distant and hollow, perhaps because the 777's stiff boom is so short. To compensate, the mic gain is too high, and the set picks up enough ambient noise to obscure the speaker if other sound sources are too close. Our bigger objection, though, was the 777's pleasingly large cans. Although their fabric was soft, the headband applies so much pressure to the cans that they pressed too firmly into our necks below both ears, making the set one of the most uncomfortable reviewed here no matter how we adjusted the band. "Military-grade" build quality shouldn't mean foxhole-class comfort.

Plantronics vents the can exteriors for an "open-air" design to let you better hear teammates. Given the mic issues, we would have preferred a closed-air model. For phenomenal clarity in all of your games and media, the 777 rules, but we sure would love to have these drivers placed in a revamped headset.

## Razer Megalodon

Never mind how awesome Razer's packaging is, right down to the hard shell

**Megalodon**
$149.99
Razer
www.razerzone.com

**Specs:** Frequency: 20 to 20,000Hz (headphones), 50 to 16,000Hz (mic); Impedance: 32 ohms (headphones); Sensitivity: 102dB @ 1kHz (headphones), -37dB @ 1kHz (mic); Cable: 10.8 ft. braided carrying case with it's subtly chemical, just-manufactured scent. (Think "new car.") Just make sure you install the latest firmware and enjoy the excellent clarity of Razer's Megaldon. Now, we don't mean that Razer achieves a miracle and really does simulate 7.1 surround with its inline USB control pod. In fact, we got the finest results in movies when outputting 7.1 and setting the control pod to stereo. Go figure. In gaming, yes, when a teammate walks around you with 7.1 enabled, you can close your eyes and get a rough—not exact—sense for where that person is. It isn't as precise as the Tritton AX 51 Pro, but it's better than straight-up stereo.

Razer doesn't use the best mic in the world. It's clear, but the highs and lows are obviously clipped from your voice. However, once adjusted, the Megalodon holds up very well against ambient noise, even in a situation where your adjacent competitor didn't read the rule about not bringing speakers. Razer's lightweight build doesn't block much outside noise, and we wish the fabric-padded cans would swivel to relieve that slight pressure below the ears.

Otherwise, this is definitely one of the better USB headset implementations available today. You have very little control over sound reproduction, but fortunately Razer's presets are plenty palatable, with great spatial separation and range. (Note: Big-headed types rejoice! The Megalodon has the longest headband reach of any headset we've ever worn.)

**Moray$^{+}$**
$59.99
Razer
www.razerzone.com

**Specs**: Frequency: 20 to 11,000Hz (earphones), 300 to 3,000Hz (mic); Impedance: 17 ohms (earphones), 2.2K ohms (mic); cable length: 4.26 ft.; Earphone SPL: 110dB; Mic SNR: 55dB min.; Weight: 12.5g

**Siberia Neckband**
$89.99
SteelSeries
www.steelseries.com

**Specs**: Frequency: 18 to 28,000Hz (headphones), 80 to 15,000Hz (mic); SPL: 104dB; Impedance: 40 ohm (headphones), 2K ohm (mic); Cable: 8.9 ft. w/ extension; Mic sensitivity: -38dB; Weight: 680g

**AX 51 Pro**
$99.99
Tritton
trittontechnologies.com

**Specs**: Frequency: 20 to 20,000Hz (satellites), 20 to 120Hz (sub); Mic SNR: 110dB/V; Cable length: 12.5 ft.; Weight: 12 oz.

## Razer Moray$^{+}$

If you don't want the bulk of a full headset on your LAN party travels, Razer's Moray$^{+}$ is a surprisingly strong option. These earbuds include three soft rubber tip sizes and an inline microphone that sounds a lot like you have it stuffed inside of a sweater during use. Recordings showed the mic clearly picking up speakers from 15 or 20 feet away, but the wearer always remained prominent enough to understand. The Moray$^{+}$'s specs may seem limited compared to most headsets, but we were surprised at the overall audio quality, which was very full with excellent spatial separation. We had to pull back the highs and push the bass a bit. The bass was fair in comparison but still pretty sweet for $50 buds.

Razer bundles adapters for the PSP 2000/3000 and the Nintendo DS Lite/DSi, plus there's a BlackBerry-sized neoprene carrying case. Enabling the mic requires using a bundled splitter dongle; without it, you only have stereo output. Overall, the Moray$^{+}$ is an excellent budget option for laptop gamers.

## SteelSeries Siberia Neckband

Some people are stuck between disliking headbands ("don't mess the hair!") and wanting better sound than what most behind-the-head designs typically offer. The Siberia units are SteelSeries' finest, with a retractable gooseneck boom and mic fidelity that's terrific, regardless of what the specs might imply. SteelSeries pushes the treble a smidge far, which is just fine in gaming: Reproduction in BioShock 2 was still realistic enough to have us groping for blood pressure meds. The bass is a bit imprecise, so we'd put these just a rung under the Creative WoWs or Plantronics 777s. Given the price, style, and inclusion of an Xbox adapter, the Siberia Neckband is a hot deal.

If there were two things to improve here, one might be the fit. Behind-the-head orientation is tough to begin with. SteelSeries keeps the open-air design light (not always a plus if you want to block ambient sounds) and the fabric pad coverings plush and comfy. But the cans still tug a bit on the tops of your ears, always feeling just slightly mispositioned. Additionally, this is one of the weaker noise-canceling mics, as it consistently picked up a lot of background distractions, although never to the point of obscuring speech.

If you don't want to destroy the 'do, get this set.

## Tritton AX 51 Pro

Seriously. Wow. After muddling along with Dolby and THX attempts at headphone surround, this is the real deal—discrete satellites kick out true 5.1 in all its precise glory. We could hear exactly where other racers were coming from in MotoGP or get a fix on not just where unfriendlies were in Left 4 Dead 2 but also a better sense of how long until they were upon us. And movie enjoyment? Consider the quintessential "Matrix" lobby shooting spree. You should hear those casings clearly falling in front of and behind you. With the AX 51 Pro, you can.

On the flip side, a great test of headset bass response comes right after the shooting spree as Neo and Trinity enter the elevator. There's a bass rumble from the approaching elevator that you should feel deep in your head; it should neither distort from excessive push nor be faint and wimpy. With the AX 51 Pros, there's no rumble at all, just a little noise. Thus explosions were more noise than boom, despite the clarity from Tritton's excellent mids and decent highs.

Tritton does an OK job with noise cancelation. There's definitely enough isolation to keep you intelligible over a crowded LAN event, although nearby voices may obscure you. Better mic directionality and/or boom flexibility could help here.

If your sound card jacks aren't labeled, expect some trial and error in configuring Tritton's four-wire dongle. Also be patient in mastering the inline level controls for mic, front, rear, center, and sub. Clearly, Tritton cut some corners in order to keep this set affordable while still making a strong play for the 5.1 precision gamers crave, but they're fair compromises. After all, you can't enjoy deep bass when you're dead.

## TurtleBeach Ear Force X11

One of the most pleasant surprises of this roundup was the X11's microphone fidelity and noise cancelation. As your environment changes, you can hear (if you record it) the X11 work for a few seconds to adjust volume levels and isolate the speaker, but when it does, the balance it strikes between keeping you understandable and cutting background noise is phenomenal. We ran one test right between a pair of boom box speakers. Yes, the X11 had to really clamp down on our vocal levels, but it also cut out most of the background and still let others hear what we were saying fairly easily. Very impressive. We found the band a bit short for larger heads, and there's enough cup pressure to make your ears want a break after an hour or two. On the other hand, if you think a long gooseneck boom says something about you, the X11 offers six full inches, and the cord, which ends in mini jacks but also a USB plug for power, is practically long enough to skip rope with between matches.

As we've seen several competitors do already, Turtle Beach puts its money in the high ranges, opting for the upper-end reproduction that will help discern footfalls, distant voices, and sharp gunfire reports. The X11 also does a fair job with bass if you don't pressure it. We had to remove most bass enhancement and crank back the inline volume level in order to achieve moderate bass response without overdriving and distortion. It's very easy to push this set too far. For under $60, this is a very good general-purpose headset that can also serve double duty on your Xbox 360.

**Ear Force X11**
$59.95
TurtleBeach
www.turtlebeach.com

Specs: Frequency : 20Hz to 20kHz (headphones), 50Hz to 15kHz (mic); SPL: >120dB @ 1kHz; Headphone amplifier Stereo 35mW/ch; 40mm diameter speakers with neodymium drivers

**Ear Force PX21**
$79.95
TurtleBeach
www.turtlebeach.com

Specs: Frequency : 20Hz to 20kHz (headphones), 50Hz to 15kHz (mic); SPL: >120dB @ 1kHz; Headphone amplifier Stereo 35mW/ch; 40mm diameter speakers with neodymium drivers

## TurtleBeach Ear Force PX21

The PX21 could be seen as a big brother to the X11. At first, we thought they might even use the same drivers, but prolonged use finally made us think otherwise, primarily because there are some situations (many movies, some games, rarely music) in which the PX21 benefits from added bass boosting via the inline control pod without walking off a distortion cliff. Satisfactory mids and highs feel similar to the X11. A 7-inch, ribbed gooseneck boom looks even more impressive, and it definitely sounds clear, but, curiously, it didn't fare as well as the X11 in blocking background noise.

Turtle Beach really guns for team players with this set, adding in handy extras such as independent inline controls for chat and game levels. Another feature called Chat Boost dynamically keeps chat levels on par with game levels so that rising game noise doesn't swamp team communication. This is possible thanks to Turtle Beach routing the mic stream over USB instead of sharing the analog line. One downsize to this wizardry is a persistent background hiss and faint buzzing. We also noticed a quiet rumble appear when working the mouse's scroll wheel. There is an "expander" mode built into the pod that we found universally useless. On the plus side, the pod features an Xbox port and the set is also built for use on PSN.

Overall, the PX21 is a very good, comfortable set at a reasonable price with just a couple of minor kinks.

## Superlative Sound

As we hinted at above, gamers needing to take or receive marching orders from their squadmates could pick up any of these sets and effectively raise the comm, so to speak. However, there was enough variation, both in purpose and performance, that it's next to impossible to pick a pair of cans that rises above the rest. Our advice: Isolate the factors that matters most to you and select the headset that hits those notes like a virtuoso. ▲

**by William Van Winkle**

GIGABYTE™

Supports intel CORE i7 inside
Supports intel CORE i7 inside
intel Chipset inside INTEL® X58
Extreme gaming performance

Supports intel CORE i7 inside
Supports intel CORE i5 inside
intel Chipset inside INTEL® P55
Intelligent performance

3 Years WARRANTY in USA & CANADA
For more information, please visit http://rma.gigabyte.us

Ready For the Big Time?

GIGABYTE **USB 3.0** Motherboards

Fast Easy Powerful

10X Super Speed

3X USB Power

GA-X58A-UD7

GA-X58A-UD3R

GA-P55A-UD7

GA-P55A-UD3

GA-P55-USB3

www.gigabyte.us

These speed settings are not guaranteed by GIGABYTE. The specifications and pictures are subject to change without notice. All trademarks and logos are the properties of their respective holders.
Any overclocking is at user's risk, GIGABYTE Technology shall not be responsible for any damage or instability to your processor, motherboard, or any other components.

# Paving The Way For Gulftown

## A Quintent Of Triple-Channel DDR3 Kits, Clocked & Compared

Once upon a time, memory matters were of the utmost importance to enthusiasts. Northbridge-based controllers were a real performance bottleneck, limiting throughput over a rickety front side bus to the processor on the other side. So, you might have had a couple of channels of DDR2-667 memory rated for nearly 11GBps aggregate bandwidth yet realized somewhere less than half of that in a handful of synthetic tests.

Of course, overclocking helped the situation significantly. Enthusiasts would ratchet up that reference clock rate, simultaneously boosting the processor's frequency and the effective memory data rate. The resulting speed-up was a great way to move more data faster, yielding notably better memory bandwidth results.

Obviously, we all know that overclocking has inherent risks, especially when you cross over from simply increasing clock settings to making voltage adjustments, as well. Those northbridge-based memory controllers were fairly tough, though, and tolerated quite a bit of tinkering with nary a heat-related failure.

Thus, it was a great time to be a memory vendor. Not only were there plenty of dual-channel kits to sell at JEDEC-approved speeds (DDR2-400/533/667/800, for instance), but power users were often willing to pay even more for specially binned modules guaranteed to run at even faster transfer rates, given the right voltage. Ample validation even made it possible for the enthusiast-oriented outfits to cover their kits with warranty support at more aggressive voltage levels.

### The State Of The PC Memory Market

Times change, though. The quest for better performance compelled AMD to launch its Athlon 64 processor with an on-die memory controller in 2003, and Intel followed suit in 2008 with its Core i7. In Intel's case especially, integrating memory control onto the processor meant defining strict specifications. Intel designed its hardware with JEDEC's DDR3 standard in mind, limiting voltage to 1.5V, plus or minus 5%. The company's official stand is that "anything over this voltage can either damage the processor or significantly reduce the processor life span."

Given Intel's commanding position in the enthusiast space right now, such tight tolerances make it difficult for memory vendors that were once able to charge premium prices for sorted memory ICs to eke a profit on commoditized modules.

As a result, we see an increasing number of companies realigning their priorities from volatile system memory to an explosive market in nonvolatile storage: solid-state drives. Corsair, Crucial, Kingston, OCZ, and Patriot—all names you probably know first and foremost for their memory products—are putting lots of effort into developing their respective SSDs, which sell at a premium and offer an incredible experiential performance increase vs. conventional magnetic storage.

That doesn't diminish the importance of system memory, though. Nor does it mean the big hitters in the RAM market are planning an exit. Power users should simply be aware that there is less variation today than there was two years ago. Most vendors are limiting their DDR3 memory kits to 1.65V or less—a scant .15V above JEDEC's spec. But that isn't keeping them from hitting transfer rates in excess of the JEDEC standard. We've rounded up five triple-channel kits rated for up to 1.65V and I/O clocks between 667 and 1,000MHz (that's DDR3-1333 to DDR3-2000).

### Corsair CMD12GX3M6A1600C8

The only 12GB kit in our roundup, Corsair's CMD12GX3MA1600C8 consists of six 2GB modules for just under $450—a significantly more economical route than kits consisting of three 4GB modules, which are priced closer to $800. Naturally, you'll need a motherboard with six memory slots to make Corsair's offering a viable option (Intel's DX58SO, for instance, only sports four slots).

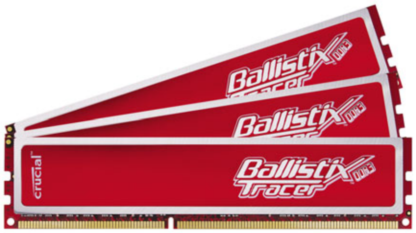
**CMD12GX3M6A1600C8**
$449 | Corsair
www.corsair.com
●●●◖

**Specs:** DDR3-1600; 8-8-8-24; 12GB (6x 2GB) unbuffered; XMP profile support; 1.65V; lifetime limited warranty

If your board of choice has the space for 12GB, Corsair's Dominator modules offer an attractive design that actually serves a purpose. Slim black aluminum heatsinks on both sides of each stick encourage convective heat dissipation, according to Corsair, drawing heat from the back of BGA memory devices soldered onto the PCB. A slotted blue heatsink sits atop the module. In a configuration where your processor fan blows through the installed memory, the fins on that heatsink make the most of air passing through.

Of course, sharp-looking heatsinks and optimized cooling fins are a means to an end. When it comes to enthusiast-class memory, that means stable operation at overclocked data rates. Corsair sells several configurations of its Dominator modules, but this kit is guaranteed to work at 1,600MTps and 8-8-8-24 timings, so it's already faster than the memory controller on Intel's Core i7 family is officially rated to go.

Corsair plays it safe by programming 1,333MTps CAS 9 SPD settings. However, we started our performance testing at the kit's highest specified speeds and feeds. We achieved our best memory overclock by dropping the multiplier on our Core i7-975 Extreme and boosting BCLK to bring the processor's frequency back to 3.33GHz, all the while increasing data rate. The idea wasn't to loosen latency in favor of bandwidth. Rather, we wanted to maintain the tightest timings possible as speeds increased. The result was a jump from 1,600MTps to 1,740MTps at CAS 8. And although Sandra 2010 indicates a greater than 2GBps bandwidth gain, none of the other tests register much of an effect. After all, we're pushing in excess of 30GBps here; the processor is hardly starved for data.



**BL3KIT25664TR1337**
$223.99 | Crucial
www.crucial.com
●●●●

**Specs:** DDR3-1333; 7-7-7-24; 6GB (3x 2GB) unbuffered; 1.65V; lifetime limited warranty

At the end of the day, Corsair's CMD12GX3MA1600C8 kit helps illustrate the challenge memory vendors face in that it's already running at the highest voltage setting Intel's integrated memory controller can be comfortably operated. Hitting higher clocks is going to mean relaxing timings, which is counterproductive. Nevertheless, this particular kit isn't designed for the aggressive overclocker. It's best suited to power users with high-end workstations who not only need 12GB of capacity but also value Corsair's guarantee of 1,600MTps data rates, which already easily exceeds the Core i7's official DDR3-1066 spec.

## Crucial BL3KIT25664TR1337

Crucial's submission costs almost exactly half as much as Corsair's, and this makes perfect sense when you consider the verbosely named BL3KIT25664TR1337 package is a 6GB kit vs. the competition's 12GB. Crucial also employs 2GB modules, meaning motherboards with six slots can be easily upgraded down the road should you decide to add capacity. In our opinion, most enthusiast platforms are well-equipped with 6GB today; only specific workstation-class machines need more.

The Ballistix kit doesn't boast formidably sized heatsinks, but it does ship with lower-profile aluminum heat spreaders available in orange, blue, red, green, and black. The latter four colors sport two rows of matching activity LEDs along the top of each module and constantly illuminated ground effects at the bottom. If you're building into a windowed case and eager to add some visual flair, moving lights that speed up during memory-intensive workloads are a nifty touch.

**KHX2000C8D3T1K3/6GX**
$323 | Kingston
www.kingston.com
●●●◖

**Specs:** DDR3-2000; 8-8-8-24; 6GB (3x 2GB) unbuffered; XMP profile support; 1.65V; lifetime limited warranty

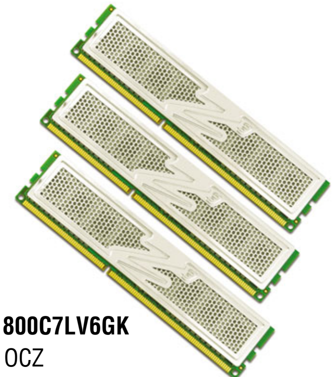
Again, though, we defer to the importance of real-world performance. Crucial doesn't hit the same aggressive data rates as some of its competitors, employing 1,333MTps. It does offer tight 7-7-7 timings, though, which should theoretically improve responsiveness. We don't get XMP profiles here, but they're really not needed given more conservative default settings.

We began testing at 1,333MTps and 7-7-7-24 timings. Because the modules were already set to 1.65V, we weren't expecting much overclocking headroom without sacrificing latency. So, it wasn't a surprise that the kit's maximum at CAS 7 was a modest 1,392MTps. Stock settings enable just under 24GBps of throughput, according to Sandra 2010, and the overclocked configuration adds less than 1GBps to that figure. Despite the fact that 3DMark Vantage and a MainConcept video encode demonstrate a slight slowdown, our WinRAR compression workload finishes two seconds faster.

Although the Crucial kit consists of three 2GB modules and is likely better-suited to overclocking, thanks to a lighter load on the processor's memory controller, an already maxed-out voltage setting leaves little room for higher data rates unless you're willing to loosen up latencies. (Not that we're worried about performance—even at the kit's rated DDR3-1333 frequency, you'd still be running in excess of Intel's official spec.) The real story here is Crucial's LEDs, which give its Ballistix kit a differentiator not seen on any other memory in our roundup. If you're a fan of flashy and plan to build your next PC in a windowed case, activity-based lighting is one of the coolest-looking additions you can find for modestly priced memory modules with enthusiast cred.

## Kingston KHX2000C8D3T1K3/6GX

Less expensive than the 12GB Corsair kit, but $100 pricier than Crucial's 6GB LED-laden offering, this Kingston kit needs something special in order to justify such a steep premium on its own 6GB combination of modules. That something comes in the form of massive aluminum heatsinks and a particularly high-end specification list. Whereas the two triple-channel packages we've looked at thus far go above and beyond what Intel says its memory controller officially supports, Kingston's KHX2000C8D3T1K3/6GX solution blows those numbers right out of the water. If you're an overclocker and need extra headroom in the memory you buy to make



**OCZ3P1800C7LV6GK**
$397 | OCZ
www.ocztechnology.com
●●●

**Specs:** DDR3-1800; 7-7-7-26; 6GB (3x 2GB) unbuffered; 1.65V; lifetime limited warranty

room for loftier BCLK targets, this kit is certainly one of your viable options.

As with the other vendors being represented here, Kingston sells a wide range of HyperX configurations based on speed-binned memory ICs. At the very top of its lineup sits a handful of DDR3-2133 modules. However, those are sold exclusively in dual-channel kits. The fastest triple-channel setups available peak at 2,000MTps. Now, generally at such an extreme data rate, you'd be looking at looser timings, but Kingston manages to validate this kit at 8-8-8—impressive, everything else considered. It even programs the necessary timings and voltages into XMP profiles onto the modules themselves.

There's a nasty little tradeoff, though. In order to run at such breakneck speeds, the DRAM bus voltage has to be set to 1.66V (over the 1.65V limit, but not by much), and the QPI voltage is cranked to 1.75V. The stock voltage there is 1.2V, so 1.75V is nearly 50% higher. It's difficult to speak to the longevity of components run that hard, but we certainly wouldn't bet a $1,000 Core i7-975 Extreme on many years' worth of operation. With that said, we didn't encounter any problems in testing the HyperX kit, and it certainly served up impressive numbers.

Our first test setup took advantage of Kingston's XMP profiles, similar to Corsair. Despite achieving lower memory bandwidth numbers than the Dominator kit, the HyperX modules managed to turn in better 3DMark Vantage scores and a more impressive MainConcept run (likely a result of the overclocked Core i7), beaten only by OCZ's kit in our WinRAR compression test. Afterward, we activated the second profile, dialing in 1,866MTps data rates, CAS 7 timings, and a more conservative (but still frighteningly high) QPI voltage of 1.6V. Predictably, the lower memory clock yielded less bandwidth and a slightly longer WinRAR compression routine. But MainConcept didn't budge, and 3DMark Vantage actually gained a few points.

It's hard to say whether the premium price is worth the marginal performance increase, but if your processor of choice doesn't offer the memory ratios you need, available headroom to hit up to 2,000MTps is a potential savior for overclocking.

## OCZ OCZ3P1800C7LV6GK

Priced closer to Corsair's 12GB kit than any of the other 6GB kits (and higher than Kingston's 2,000MTps HyperX offering), OCZ's OCZ3P1800C7LV6GK kit tries to add value by simultaneously hitting big data rates at the lowest latency possible. Instead of going for one of the nice round numbers exposed by our Core i7-975 Extreme processor and Asus P6X58D Premium motherboard, though, it's rated for a maximum of 1,800MTps at CAS 7. For a bit of perspective, that's 200MTps beyond Crucial's Ballistix kit at a roughly $150 premium. There aren't any flashy LEDs to speak of here, nor are there large heatsinks with fins to purportedly catch air blowing through the processor. Instead, OCZ adorns these modules with a honeycomb-style heat spreader affixed with double-sided tape. It's a simple, unpretentious design.

Hitting a 1,800MTps data rate requires a bit of fancy BIOS footwork. We dropped the Core i7's multiplier from 25X to 22X, increased the BCLK from 133MHz to 150MHz, and achieved a round 3.3GHz.

## Benchmarks & How We Tested

Because differences in memory performance are subtle at best, we used a fresh Windows 7 x64 installation with all unnecessary services disabled. The test machine's hardware included a Core i7-975 Extreme processor, an ASUS P6X58D Premium motherboard, an AMD ATI Radeon HD 5850 graphics card (with Catalyst 10.2 drivers), and an Intel X25-M 160GB second-generation SSD. We made all of our adjustments to memory settings through the P6X58D's BIOS.

Software versions included the following: 3DMark Vantage 1.0.2, WinRAR 3.92, Sandra 2010c, and MainConcept 1.6.1.

| | Corsair CMD12GX3M6A1600C8 | | Crucial BL3KIT25664TR1337 | |
|---|---|---|---|---|
| | Stock | Max Overclock | Stock | Max Overclock |
| | 1,600MTps, CAS 8 | 1,740MTps, CAS 8 | 1,333MTps, CAS 7 | 1,392MTps, CAS 7 |
| **3DMark Vantage** | 15447 | 15455 | 15418 | 15403 |
| **MainConcept 1.6.1******** | 1:21 | 1:22 | 1:23 | 1:24 |
| **WinRAR******** | :50 | :51 | :55 | :53 |
| **SiSoftware Sandra 2010** | | | | |
| Aggregate Memory Performance | 28.2GBps | 30.44GBps | 23.73GBps | 24.65GBps |
| Price | $449 | | $223.99 | |
| CPU Rating | ●●●◖ | | ●●●● | |

* XMP Profile #2 sets a 3.43 GHz CPU speed, 143 MHz BCLK, a 1.7V QPI voltage and 1.66V DRAM Bus voltage

** Stock setting of 1,800MTps requires 150MHz BCLK and 22V multiplier; also requires 1.4V QPI voltage

**CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT**

**PV236G2000LLKB**
$289 | Patriot
www.patriotmem.com
●●●●◖

**Specs:** DDR3-2000; 8-8-8-24; 6GB (3 x 2GB); unbuffered; XMP profile support; 1.65V; lifetime limited warranty

Unfortunately, we couldn't get the kit to operate stably with a stock QPI voltage at its rated ceiling, so we used a 1.4V setting (in tandem with a 1.65V DRAM bus voltage) to generate our results.

The good news here is that even at 1,800MTps OCZ's kit turns in some of the best bandwidth numbers we've seen. It was bested only by our overclocking efforts, which took the Platinum-series kit to 1,866MTps using a 25X multiplier and 133MHz BCLK, exceeding 31GBps. Though our real-world tests generally lagged behind Kingston's less expensive kit, OCZ's overclocked WinRAR result took first place.

Of course, the issue we run into is that the Platinum-series modules sell for a lot more online than the Kingston and Patriot kits and don't necessarily offer a benefit over the memory boasting even greater headroom. Even at $100 less, the OCZ kit would have a difficult time competing against Crucial's best effort. But at nearly $400, you're better off going with the less expensive kit and sinking the savings into solid-state storage.

## Patriot PV236G2000LLKB

Overclockers are downright discerning when it comes to picking the hardware that'll offer the best value. After all, isn't that the *point* of overclocking—to get extra performance from the most flexible hardware at the best possible price? At first blush, Patriot's Viper PV236G2000LLKB would seem to be all about that combination of fast, flexible, and affordable. The kit is rated for 2,000MTps at 8-8-8-24 timings. It supports XMP memory profiles, making configuration a one-setting affair in your BIOS (or you can manually set up custom clocks and voltages). Moreover, Patriot prices the 6GB trio of modules under the $300 mark, beating out the only other 2,000MTps package in this roundup by more than $30.

With such enthusiast appeal in mind, we tested the triple-channel kit using its XMP profile and our own combination of settings. With XMP enabled, the test system runs at 3.43GHz via a 143MHz BCLK and a 24X multiplier. Patriot uses the same 1.66V DRAM bus voltage as Kingston but tries to go a little lighter on the QPI voltage with a 1.6V setting. This wasn't quite enough for stability, though, so we had to bump this to 1.65V. Our own configuration sought to get the processor back to its stock frequency, so we used a 145MHz BCLK and 23X multiplier, yielding 3.33GHz and a 2,034MTps memory data rate.

Despite memory bandwidth numbers lower than Corsair and OCZ, Patriot's PV236G2000LLKB turned in above average 3DMark Vantage results, MainConcept encode times, and WinRAR scores. This is almost certainly a result of the kit's XMP profile forcing a processor overclock and not necessarily representative of any boost you might see thanks to 2,000+MTps DDR3 memory. Nevertheless, when you're overclocking a CPU with limited memory ratios, the flexibility to hit aggressive data rates might very well be what enables a stable 4GHz or more.

Physically, the kit itself is unassuming, consisting of green PCBs with BGA ICs covered by thin, black, aluminum heatspreaders that form fins above each module. They aren't particularly tall, though, so it's unlikely that they'll prevent the installation of oversized heatsinks. Patriot more than makes up for the lack of visual flair, however, by including a bundled license for 3DMark Vantage—a $20 value-add.

We're not necessarily fans of running the Core i7's QPI bus at 1.65V to achieve 2,000MTps (or having to increase voltage beyond specs that should work out of the box). However, Patriot does everything else well here, enabling real value on a platform also capable of unmatched performance in the hands of the right overclocker. ▲

**by Paul Cross**

| Kingson KHX2000C8D3T1K3/6GX | | OCZ OCZ3P1800C7LV6GK | | Patriot PV236G2000LLKB | |
|---|---|---|---|---|---|
| XMP Profile #1 | XMP Profile #2 | Stock | Max Overclock | XMP Profile #1 | Manual Config |
| 2,000MTps, CAS 8* | 1,866MTps, CAS 7 | 1,800MTps, CAS 7** | 1,866MTps, CAS 7*** | 2,000MTps, CAS 8 | 2,000MTps, CAS 8 |
| 15509 | 15555 | 15433 | 15543 | 15558 | 15445 |
| 1:20 | 1:20 | 1:23 | 1:25 | 1:21 | 1:23 |
| :47 | :48 | :48 | :46 | :47 | :47 |
| 25.56GBps | 24.13GBps | 30.35GBps | 31.66GBps | 25.31GBps | 25.66GBps |
| $323 | | $397 | | $289 | |
| ●●●◖ | | ●●● | | ●●●●◖ | |

*** Stock setting of 1,800MTps set to 1,866MTps due to processor memory ratios
****(minutes:seconds)

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

# QUALI
# WEB HOSTING

VacantPixels: Designs With Your Style in Mind.

The Scottish Rite Masons was seekeing restoration funding for Oklahoma's First Legislative Hall. VacantPixels was tasked to create a DVD-Rom from them with the look and feel of what the Hall will look like once completed as a conference center in Guthrie Oklahoma.

Latest News

Brothers Bottling Company, LLC has tasked me to create some labels for their bottled water, and a test website. VacantPixels was entrusted to create a product line that fit two categories of commercial water and a high end line.

"Working with startup companies on a tight budget, my clients know an online presence is needed. I use 1&1 exclusively to satisfy their requests for reliable hosting at affordable rates."

Lance Ochs, www.vacantpixels.com

**As the world's largest web host, with over 20 years of experience and state-of-the-art data centers worldwide, 1&1 is dedicated to security, innovation and value when it comes to your website.**

## 99.9% Uptime

Reliability is essential for your business website. Our new data center features 30 GBit connectivity with high redundancy.

EPA GREEN POWER PARTNER

THIS COMPANY USES CERTIFIED CLEAN ENERGY bef

MONEY BACK GUARANTEE

## 90-Day Money Back Guarantee!

We want our customers to be 100% satisfied. If you decide that you are not completely happy, within 90 days from when your initial order was placed, you'll receive your money back – no questions asked.

*Offer valid as of March 1, 2010. 12 month minimum contract term applies. Setup fee and other terms and conditions may apply. Visit www.1and1.com for full promotional offer details. Program and pricing specifications and availability subject to change without notice. 1&1 and the 1&1 logo are trademarks of 1&1 Internet AG, all other trademarks are the property of their respective owners. © 2010 1&1 Internet, Inc. All rights reserved.

MEMBER OF united internet

Call **1-877-GO-1AND1**

# TY

**6 MONTHS**

**50% OFF**

**ON THE 1&1 BUSINESS PACKAGE***

# AT THE BEST PRICE!

| | 1&1 | Network Solutions | Go Daddy |
|---|---|---|---|
| **Hosting Package** | **Business** | **Small** | **Unlimited** |
| **FREE Domains**<br>(.com, .net, .org, .info, .biz) | 3<br>(for the life of your package) | 1<br>(first year only) | – |
| **Monthly Transfer Volume** | Unlimited | 3,000 GB | Unlimited |
| **Mailbox Size** | 2,000 MB | 1,000 MB | 1,000 MB |
| **Private Domain Registration** | FREE | $9.00/year | – |
| **Search Engine Submission** | ✓ | ✓ | Extra charge applies |
| **Money Back Guarantee** | 90 days | 30 days | – |
| **Special Offer** | 6 MONTHS<br>50% OFF | – | – |
| **Price Per Month** | ~~$9.99~~<br>$4.99<br>for 6 months* | $9.96 | $14.24 |
| **First Year Hosting Total**<br>(with discount) | $89.91/year | $128.52/year | $170.88/year |

## 24/7 Toll-Free Support!

1&1 customers have unlimited access to our 24-hour phone and e-mail technical support. Call anytime, day or night!

## Special Domain Offer: .com domains $6.99/first year!

Need additional domain names? All 1&1 domains come with FREE private domain registration.

**Visit our website for a full list of this month's special offers.**

1&1®

Visit us now **www.1and1.com**

# Ballistic Sentinel XK

Ballistic is a newcomer to the boutique PC realm, but it has strong roots as a contract manufacturer in the business market. In its initial press release, Ballistic said that its goal was to deliver “the quality and performance of a boutique builder while offering the most affordable gaming computers on the market.” On its Web site, the company even challenges that the price of a system will be barely over 5% of what it would cost to build it yourself. Ballistic also backs its PCs with three-year warranties. Here, we check out the Ballistic Sentinel XK.

The Sentinel XK certainly looks the part of a serious gaming PC. At the top of our test model is the Aerocool Touch 2000 fan controller. It gives you fan speed control of two 120mm internal fans near the liquid-cooling radiator, the 120mm fan at the base of the case, and the 120mm rear fan. There are also two 230mm fans—one in front of the hard drive cage and one on the side—that feature blue LEDs, and in combination with the two blue cold-cathode lights, the interior was clearly illuminated. Other than the blue lights, the only other colors on the black-clad Cooler Master Storm Sniper were the color-coded front-panel inputs for eSATA, USB, and audio.

Ballistic overclocked the Intel Core i7-920 up to 3.6GHz, and it ran stable during our benchmarking process and Prime 95 overnight run. At press time, Ballistic offered a free 20% or more CPU overclock (typically $90). The overclock on our test model was nearly a 40% speed increase. ATI’s dual-GPU Radeon 5970 was also overclocked, with around a 10% increase in core clock speed, and although we experienced an occasional lockup in Dirt 2, it was otherwise stable. Three 2GB sticks of Mushkin Silverline DDR3-1600MHz, a 1.5TB Seagate Barracuda, and an LG BD-ROM/16X DVD burner combo drive rounded out the system.

The Sentinel XK performed well in our benchmarks, including the top fps rate (54.9) in Dirt 2 at 2,560 x 1,600. Its 3DMark Vantage score of 23216 (a 23187 GPU score and 23302 CPU score) was also impressive. The nearly 1GHz processor overclock let the Sentinel XK deliver Cinebench 10 (score of 21952), POV-Ray Beta (4889.20 pixels per second), and SiSoftware Sandra 2010 Lite scores that were competitive with boutique systems featuring more expensive Core i7 processors.

The Sentinel XK made a strong first impression for Ballistic. It offered an elegant interior design and superb overclocking chops, so we’d definitely recommend it to those looking for a new gaming rig. We also like the inclusion of a three-year warranty. ▲

**by Nathan Lake**

**Sentinel XK**
$2,268 (as tested)
Ballistic
www.ballisticgamingpc.com
●●●●◐

## Benchmark Numbers

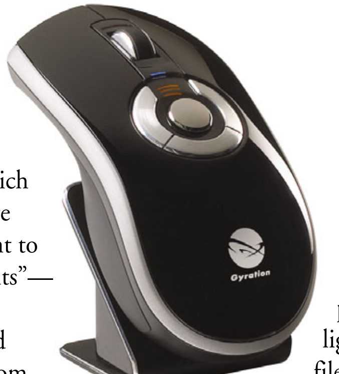
| | Ballistic Sentinel XK |
|---|---|
| **3DMark Vantage** | |
| Overall | 23216 |
| GPU Score | 23187 |
| GPU1 (fps) | 71.27 |
| GPU2 (fps) | 64.46 |
| CPU Score | 23302 |
| CPU1 (Plans/s) | 3280.08 |
| CPU2 (Steps/s) | 29.49 |
| **PCMark Vantage Pro 1.0** | |
| Overall | 8450 |
| Memories | 7121 |
| TV And Movies | 5672 |
| Gaming | 9097 |
| Music | 7743 |
| Communications | 7737 |
| Productivity | 6904 |
| HDD | 3597 |
| **SiSoft Sandra 2010 Lite** | |
| **Processor Arithmetic** | |
| Dhrystone ALU (GIPS) | 110.37 |
| Whetstone iSSE3 (GFLOPS) | 77.87 |
| **Processor Multi-Media** | |
| Integer x16 iSSE4.2 (Mpixels/s) | 203.62 |
| Floating Point x8 iSSSE3 (Mpixels/s) | 151.80 |
| Double x4 iSSE2 (Mpixels/s) | 82.42 |
| **Memory Bandwidth** | |
| Integer Buffered iSSE2 (GBps) | 24.00 |
| Floating-Point Buffered iSSE2 (GBps) | 24.00 |
| **Cinebench 10** | |
| Score | 21952 |
| Time* | 0:44 |
| POV-Ray 3.7 Beta** | 4889.2 |
| Dirt 2 | 54.9 |
| FarCry 2 (8XAA) | 47.91 |
| Left 4 Dead (16XAA) | 125.4 |

* minutes:seconds
** pixels per second
Games tested at 2,560 x 1,600.

**Specs:** CPU: Intel Core i7-920 @ 3.6GHz; GPU: AMD ATI Radeon HD 5970; RAM: 6GB Mushkin Silverline DDR3-1600MHz; Motherboard: Evga x58 Micro Edition SLI; Storage: 1.5TB Seagate Barracuda; OS Windows 7 Home Premium (64-bit)

**CPU RANKING** ○ **0 = ABSOLUTELY WORTHLESS** | ●●◐ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

# Gyration Air Mouse Elite



**Air Mouse Elite**
$99.99
Gyration
www.gyration.com

Back in December 2008, I spent several weeks with Gyration's first-generation Air Mouse. From a geek standpoint, the mouse impressed due to the proprietary MotionSense technology and GyroTools (now called MotionTools) software that Gyration included letting you use the mouse on or off the desktop and configure the buttons in multiple ways. Still, the clunky, gray Air Mouse wasn't exactly a stunner aesthetically. Meet the new boss: the ambidextrous Air Mouse Elite, a wireless (2.4GHz RF) up-grade oozing refinement without losing any of the original's versatility.

Although lightweight and a bit plastic-y, the curvy black-and-silver Elite is undeniably handsome and begs to be held. Once you do, you'll find three configurable buttons, a scroll wheel (no side-to-side scrolling), and trigger. Typically, good looks aren't something I stress in mice. Here, it matters because with MotionSense—which uses a "tiny gyroscope to measure the angle and speed of movement to move a cursor between two points"—the Elite is an excellent HTPC companion. Press the trigger and you can guide a mouse cursor from your couch with impressive accuracy and flow entirely without use of a hard surface.

MotionTools is also HTPC-friendly, as it includes support for configuring up to eight in-air mouse gestures. So, for example, you can decrease system volume with a downward swipe or navigate Web pages with left and right swipes. Setup is drag-and-drop easy, and you can establish configurations for separate General, Internet, Media Player, and Presentation (laser pointer and highlighter included) profiles. In Media Player, for example, you can set the Elite's buttons to launch apps, activate a virtual keyboard, display a playlist, search folders, and more. Perfecting gestures took some practice, but they were impressively responsive from varying distances in my tests. Desktop performance was typical of a standard laser mouse.

Overall, if you're an HTPC owner, professor, road warrior, or presenter of any kind, the Elite may be an ideal fit. Just be prepared to sacrifice a USB port to the included battery charging stand. ▲

**by Blaine Flamig**

**Specs:** 2.4GHz RF USB; Range: up to 100 feet; three customizable buttons; MotionTools software (Windows-compatble only)

# Zalman MS1000-HS2

**MS1000-HS2**
$185.99
Zalman
www.zalmanusa.com
● ● ● ●

Zalman's heatsinks are known for a number of things: innovation, quiet (if not silent) operation, build quality, great looks, and, let's be honest, commensurate pricing. This classy chassis lives up to the company's reputation in each category.

The MSRP for this steel case made our throat constrict a little. Then we started to absorb the MS1000-HS2's list of features. It took awhile. It's a long list.

For starters, you can pull out either of the case's modular, 3.5-inch drive bay units and move it higher or lower in the bay rack. Each unit has a SATA backplane and three tool-less removable trays for drive swapping.

Power users interested in a case like this are interested in SSDs. Zalman takes the hint and includes a screw-in tray for a pair of 2.5-inch units, which takes up one 5.25-inch bay. Besides using silent drives, other factors contributing to overall noise reduction are an acoustic mat and various vibration dampening mechanisms. Liquid cooling can also help to limit decibels, so you'll find a pair of tubing sphincters in the rear.

You'll still need airflow, of course, and so the MS1000-HS2 is partially populated with big fans and provisions for bigger ones. The filtered bottom vent is a prime candidate for an optional 140mm blower, unless you have a long power supply. Speaking of airflow, Zalman gives you loads of hidden channels for cable management.

Described as a "Professional Mid-Tower Enclosure" on the box, this case is less about cubicle-style business and more about pro graphic design, pro CAD, or pro gaming. It's very understated, to be sure, but one look at its cooling potential and modular configurability will quicken the blood of any power enthusiast. ▲

**by Marty Sems**

**Specs:** Materials: Steel, plastic; Motherboard support: ATX, MicroATX; Bays: 4 5.25-inch external, 6 3.5-inch with SATA backplanes and removable trays, 2 internal 2.5-inch SSD; Expansion slots: 7; Dimensions: 19.7 x 7.9 x 22.1 inches (HxWxD); Weight: 26.5 lbs; Fans: Rear of 3.5-inch drive cage 1 92mm with speed control, Rear 1 120mm, Top 1 120mm

**CPU RANKING** ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT

# Tech NPS HP-750-G14C 750W

**HP-750-G14C 750W**
$125
Tech NPS
www.technps.com
●●●●

Tech NPS is an online technology retailer that also manufacturers some of its own products. The Tech NPS HP-750-G14C 750W PSU is one of these products.

Aside from the main power connectors, the Tech NPS 750W is completely modular. PSU bears an 80 Plus badge, has overload and over-voltage protection, and is SLI- and CrossFire-ready.

The 750W is uniformly black with Tech NPS spec stickers on the top and side and a black 140mm fan covering the bottom. But flashy or not, the 750W asserted dependable performance, which is what really counts in our book.

In order to examine the HP-750-G14C a little further, we tested it with one of our more demanding systems. To load pressure on the PSU, we simultaneously ran four instances of Prime95 (one for each CPU core), looped 3DMark06, and played an audio CD continuously for about three hours. Over this time, our system maxed out at 418 watts. The Tech NPS 750W held stable throughout the testing period, without any glitches.

The Tech NPS 750W's price is comparable to other 80 Plus-certified, modular 750-watt PSUs, reassuring us of its capable and long-lasting performance. ▲

**by Kris Glaser Brambila**

## Specs

| | |
|---|---|
| **Rated continuous (W)** | 750 |
| **12V Rails** | 4 |
| **+12V continuous (A)** | 18 |
| **+5 continuous (A)** | 28 |
| **+3.3 continuous (A)** | 30 |
| **SLI/CrossFire certified** | Both |
| **Max wattage tested** | 418 |
| **Power factor tested** | .95 |
| **Efficiency rating (as advertised)** | 80% |
| **Cable side** | Motherboard |
| **Fan location** | Bottom |
| **Fan(s)** | 140mm |
| **PCI-E** | 2 (6 pin), 2 (6+2 pin) |
| **Main 12V** | 20 + 4 pin |
| **8-pin EPS 12V** | 2 (6+2) |
| **4-pin 12V** | 1 |
| **SATA** | 4 |
| **4-pin Molex** | 6 |
| **Floppy** | 2 |
| **Length (including cable bend)** | 6 inches |
| **Warranty** | 2 years |

**Test system specs:** Processor: 3GHz AMD Phenom II X4 940; Motherboard: Biostar TA790GX 128M (AMD 790GX + SB750); GPU: ATI Radeon HD 5900 Series; Memory: 4GB Crucial DDR2-800; Hard drive: 1TB Western Digital Caviar Black; Operating System: Windows 7 32-bit.

# Silverstone SUGO SG04-FH

**SUGO SG04-FH**
$139.99
Silverstone
www.silverstonetek.com
●●●◖

Last year, we covered two chassis from Silverstone's Raven series, which highlight the company's dedication to innovative design and appeal to hardware enthusiasts. The Silverstone SUGO SG04-FH follows suit in its craftsmanship, but it instead tightly packs high-performance components into a small form factor.

Using the SUGO SG03 model as a launching point, the SG04-FH includes a number of expansion features that turn a diminutive case into a LAN-friendly enclosure with extra cooling power. Inside the 13 pounds of aluminum and steel, you'll find room for two 10.5-inch graphics cards, one of which can securely rest in the 3.5-inch removable device bracket on the left interior panel.

In order to remove the right front and top front panels, you must remove some ill-placed screws. Although this is inconvenient, installing the two 120mm cooling fans inside the right front-panel door requires a simple snap into place.

The rear panel has four expansion slots, which can conveniently serve as air vents if not utilized. The PSU opening supports reversible installation with up to a 1,500W power supply; however, you can rule out adding a third-party cooler due to space restrictions. You can install two 3.5-inch hard drives on the detachable bottom panel. This is smart for saving space and practically effortless to remove because it's secured with two screws.

An added benefit on the SG04-FH is the incredibly sturdy travel handle made of die-cast aluminum that stretches across the top panel of the case. You can easily lift the SG04-FH without a second thought; there's no awkward lugging this case by the edges. The rest of the all-black body doesn't scream "high maintenance," and its clean lines contribute to its understated architecture.

For a chassis that's approximately the size of a gas can, the SG04-FH can hold its own in terms of component support and resilience. ▲

**by Joanna Safford**

**Specs:** Materials: steel (chassis), aluminum (front panel, handle); Motherboard support: microATX; Bays: 5 5.25-inch external, 2 3.5-inch internal; Expansion slots: 4; Expansion card support: up to 10.5 inches; Dimensions: 16.4 x 7.9 x 13.7 inches (HxWxD); Weight: 6kg; Fans: Front: 2 120mm, Rear: optional cross-flow fan; Front ports: 2 USB 2.0, 1 audio, 1 mic

**CPU RANKING** ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

POWER COOLING

• Aerodynamically Cooling Performance

While the high optimized pure copper heat... capacity 120mm fan

Anyway, besides
performance, CN
great looks, differing from t
coolers based on the tower de
claim for attention at LAN parties
a computer with a transparent side wi
green glow of the fan is weak but is also a p

CNPS10X Perf
fantastic, we hav
cal. It allows CNPS10X
very quiet when no extre
required, and also allows that yo
rificing silence for a better cooling or
silence.

NEW CPU COO
HIGH PERFORMANCE & ULTRA QUIET
CNPS10X
PERFORMA

ZALMAN
COOL INNOVATIONS
ZALMAN FORUM
You Tube

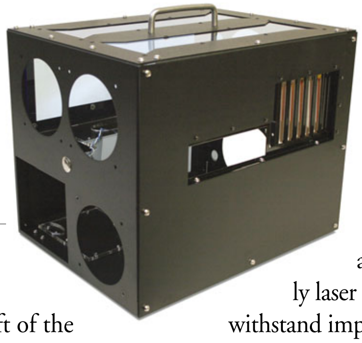
Available at
amazon.com Fry's ELECTRONICS Memory Express Computer Products Inc. www.memoryexpress.com MICRO CENTER NCIX.com newegg.com TigerDirect.com

# Mountain Mods H2gO Aluminum Cube

Looking for a portable case that still gives you flexibility with component, lighting, and cooling choices? Mountain Mods' H2gO Aluminum Cube weighs in at only 11 pounds (without any internal hardware), and you can opt to purchase it with a handle that makes it easier to tote around. The H2gO also features a two-chamber design that isolates the power supply, optical drives, and hard drives for improved cooling.

Our H2gO featured a black wrinkle powder coat, but you can purchase it in anodized black, brushed aluminum, a mirror black powder coat, or a custom powder coat color. You can also choose among five colors of acrylic panels to match your mod choices. Mountain Mods includes a set of 120mm hard drive racks, which attach directly to a 120mm fan, and with six 120mm fan mounts, you have plenty of placement options. You're more limited with the position of the optical drives, which must be installed on the bottom left of the front chassis.

**H2gO Aluminum Cube**
$249.99 (as tested)
Mountain Mods
www.mountainmods.com
● ● ● ●



The upper and lower sections of the H2gO are separated by a clear acrylic motherboard tray that supports ATX and microATX boards. There are also a few precut holes in the tray that made it easy for us to attach cables and gave us plenty of free space to maneuver when installing hardware.

The H2gO offers seven expansion slots on one side of the case, and on the other side, there's an acrylic panel that lets you show off your motherboard hardware. The acrylic panels were perfectly laser cut and thick enough to withstand impacts.

The only real downside to the H2gO was the sharp aluminum edges, which left us with a few cuts and scratches. Otherwise, we liked that the H2gO provided enough room for all types of hardware, and its multiple-fan design delivers plenty of airflow. ▲

**Specs:** Motherboard compatibility: ATX, microATX; Bays: 3 5.25-inch external, 3 3.5-inch internal; Fans: 6 120mm fan mounts (three on front chassis, three rear chassis); Expansion slots: 7

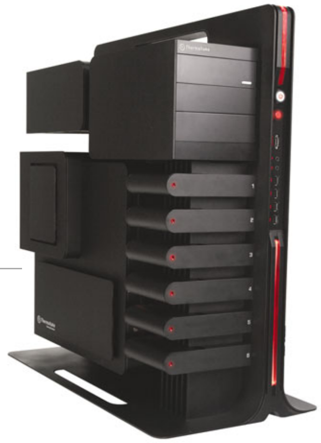
**by Nathan Lake**

# Thermaltake Level 10

First announced more than a year ago, and as asymmetrical as Mad Max's shoulderpad, this whomping big chassis is a more radical factory mod than HP's Blackbird. Its dedicated site is all Flash and hyperbole, so let's make things a little clearer, yes?

Get past the Level 10's $799 kidney punch of a price tag, and what remains is more practical than it looks. Its black aluminum is not only a diametric rebuttal to all that glossy white plastic in the world, but a heatsink, too.

**Level 10**
$799
Thermaltake
www.ttlevel10.com
● ● ● ● ◖



Hinged thermal isolation chambers clinging to a stalwart superstructure—that's one way to look at the Level 10. Alternatively, lay a full tower on its side and then melt the other side panel all over the PC components.

The mainboard, hard/solid drives, optical drive group, and power supply each have their own bachelor pads. There was room for big hardware in our unit, including a Radeon HD 5970, a Corsair HX1000W PSU, and a Rosewill FORT120 tower heatsink. Most of the lockable compartments have filtered intakes and/or fans. Fan speed controls would have been nice, although the Level 10 isn't exactly loud as shipped.

The narrow tower of this case nevertheless provides great channels for cabling, accessible under the removable motherboard tray and the rear panel. The latter's captive, spring-loaded retention screws are designed to avoid scratching the case when you remove the panel. Speaking of which, you'll need to take care when you're removing and replacing things such as the mainboard tray, as it wouldn't be hard to gouge a surface you won't be able to hide.

The takeaway is that the Level 10 gives you easy access to most parts of your PC without an open bench case's dust collection, EMI concerns, and homeliness (to some). Overclockers may get higher numbers and potentially longer device life. And aesthetes will get art. ▲

**Specs:** Materials: aluminum; Motherboard support: ATX, MicroATX; Bays: 3 5.25-inch external, 6 3.5/2.5-inch with SATA backplanes and removable trays; Expansion slots: 8; Dimensions: 26.2 x 12.5 x 24.2 inches (HxWxD); Weight: 47.1 lbs.; Fans: 3.5/2.5-inch drive bays: 2 60mm, Motherboard 1 140mm intake, 1 120mm exhaust

**by Marty Sems**

**CPU RANKING** ○ **0 = ABSOLUTELY WORTHLESS** | ● ● ◖ **2.5 = ABSOLUTELY AVERAGE** | ● ● ● ● ● **5 = ABSOLUTELY PERFECT**

# AMD
# Phenom II X2 555 Black Edition & AMD Athlon II X2 255

**Phenom II X2 555 BE**
$99
AMD
www.amd.com
●●●◖

**Athlon II X2 255**
$74
AMD
www.amd.com
●●●

**Specs (Phenom II X2 555):** Socket AM3; Clock speed: 3.2GHz; HyperTransport 3.0 Link: 4GHz full duplex; 45nm process; Cache: 6MB shared L3 cache; 80W max TDP

**Specs (Athlon II X2 255):** Socket AM3; Clock speed: 3.1GHz; HyperTransport 3.0 Link: 4GHz full duplex; 45nm process; Cache: 1MB L2 cache per core; 65W max TDP

For quite a while now, AMD has been playing the price-for-performance game with its processors. Frankly, it's been doing a pretty good job of it, too, offering good chips for great prices, and the Phenom II X2 555 BE and Athlon II X2 255 are more of the same. The release of the two processors coincides with that of the new 890GX chipset.

Comparing the Phenom II X2 555 BE and Athlon II X2 255 to one another is interesting, as both have two cores and almost identical clock speeds (3.2GHz and 3.1GHz, respectively). The big differences between the two are the cache (6MB shared L3 and 512KB L2 per core vs. 1MB L2 per core), max TDP (80W vs. 65W), and the amount of supported memory (DDR3-1333 vs. DDR3-1066). Being the Black Edition, the Phenom II X2 555 also has unlocked features for overclocking.

In benchmarking, the 555 is the better chip, whipping the 255 in 3DMark Vantage, S.T.A.L.K.E.R., and Cinebench 10. Obviously, being in different CPU families, that's to be expected, but it's notable how clear the disparity is.

Although we're comparing the 555 and 255 here, the 555 actually offers more comparable performance to last year's top-of-the-line Phenom II X4 940 and 955. (See pages 43 and 29 in the March 2009 and July 2009 issues, respectively.) The 555 acquitted itself well in our 3DMark Vantage and PCMark Vantage benchmark runs. However, in tests such as Cinebench 10, the disparity between the X4s and this X2 highlights just how important those two extra cores are for performance.

At $99, the Phenom II X2 555 BE is a very nice bargain, which we've come to expect from AMD. It does lack that quad-core zing, though, which is a detriment. (For another $20, you can grab the new Athlon II X4 635.)

Incredibly, the Athlon II X2 255 costs just $74. For a low-budget system, that price is awfully tough to beat. To put it in perspective, you can easily spend twice that on the motherboard you'd use with it.

One surprising result was how well both CPUs did in gaming benchmarks, delivering excellent frame rates in both S.T.A.L.K.E.R. and World In Conflict.

The 555 and 255 are two more in a long line of processors designed for low-cost systems that will serve you well as long as you don't push them too far. The 555 is impressive for a dual-core chip, but on the whole, there's nothing new to see here. ▲

**by Seth Colaner**

## Benchmark Results

| | Phenom II X2 555 BE | Athlon II X2 255 |
|---|---|---|
| **3DMark Vantage** | | |
| Overall | P7052 | P5742 |
| GPU | 7748 | 7282 |
| GPU Test 1 | 23.87 | 22.78 |
| GPU Test 2 | 21.48 | 19.83 |
| CPU | 5555 | 3514 |
| CPU Test 1 | 714.44 | 402.78 |
| CPU Test 2 | 8.73 | 6.75 |
| **PCMark Vantage Pro** | | |
| Overall | 5408 | 4042 |
| Memories | 4575 | 3310 |
| TV And Movies | 3472 | 2717 |
| Gaming | 4798 | 3988 |
| Music | 6129 | 4374 |
| Communications | 5531 | 3843 |
| Productivity | 4318 | 3086 |
| HDD | 4173 | 3850 |
| POV-Ray 3.7** | 1377.95 | 1039.79 |
| WinRAR 3.71* | 3:08 | 3:35 |
| **Cinebench 10** | | |
| Multi-threaded* | 2:40 | 3:32 |
| Multi-threaded (score) | 5494 | 4158 |
| **S.T.A.L.K.E.R.** | | |
| 1,280 x 1,024 | 84.234fps | 68.650fps |
| **World In Conflict** | | |
| 1,280 x 1,024 | 37fps | 33fps |

* minutes:seconds
** pixels per second
Games tested at 1,280 x 1,024.

**Test system specs:** Motherboard: Gigabyte GA-890GPA-UD3H; RAM: 2GB OCZ DDR3-1333; Graphics: ATI Radeon HD 5750; Hard Drive: 150GB Western Digital Raptor 1500

**CPU RANKING** ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

# Zalman Z7 Plus

Zalman's new Z7 midtower chassis isn't for every power user. Still, its combination of striking looks, thoughtful features, and upgradability will give mainstream users and family members one to grow on.

The Z7 comes in a couple of forms. This one, the Plus model, has a strikingly sculpted side intake fan duct with an installed 120mm fan and room for one more (140mm or smaller; Zalman throws in an extra 120mm blower). There's a speed dial—erm, let's rephrase that—an externally accessible dial with which to control the installed fans' rpm.

In addition to the Z7's floor-to-ceiling drive bays, we like the fact that one is SSD-friendly. The 5.25-inch bays are tool-less, and the 3.5-inch ones have rubber antivibration grommets. The mainboard tray doesn't come out, but it does have a processor socket access hole big enough to let you install an aftermarket heatsink without removing the mobo. Out back are tool-less expansion card retainers and a pair of liquid cooling ducts.

Despite its many bays, fans, and other features, the Z7 is a little too compact for serious graphics users and drive accumulators. We couldn't wedge a reference Radeon 5970 in place without shaving its ductwork to clear the drive tower. Moreover, hard drives protrude out of the bays a good inch and a half, plus cables. Long video card owners would need to stagger their mass storage units and video card(s). SLI and CrossFireX would be iffy in this case.

Other minor beefs include the Z7's PSU location at the top of the case, not the bottom, plus the fact that you can't upgrade the USB 2.0 ports under the top panel's lid. These quibbles aside, the Z7 Plus has a lot to like at a reasonable price. ▲

**Z7 Plus**
$74.99 | Zalman
www.zalmanusa.com
●●●

**by Marty Sems**

**Specs:** Materials: Steel, plastic; Motherboard support: ATX, microATX; Bays: 4 5.25-inch external, 5 internal 3.5-inch HDD, 1 external 2.5/3.5-inch SSD/floppy/HDD; Expansion slots: 7; Dimensions: 18.6 x 8.8 x 19.5 inches (HxWxD); Weight: 17 lbs.; Fans: Side 1 120mm with speed control, Rear 1 120mm, Front of drive cage 1 120mm, Extra 1 120mm

# Gigabyte 890GPA-UD3H

Reviewing motherboards is a fickle business. Sometimes, there's not a lot to talk about, such as when a particular board is just a gently updated version of its predecessor, while other boards are chock-full of so many new features that you can barely mention them all.

The Gigabyte 890GPA-UD3H falls solidly in the latter category. The board sports the new 890GX chipset, which has an ATI Radeon 4290 IGP, supports the impending Phenom II X6 processors, and has native support for SuperSpeed USB 3.0. The two onboard SuperSpeed USB 3.0 ports are capable of up to 5Gbps data transfer and are equipped with 3x USB Power Boost, which is designed to further enhance USB performance.

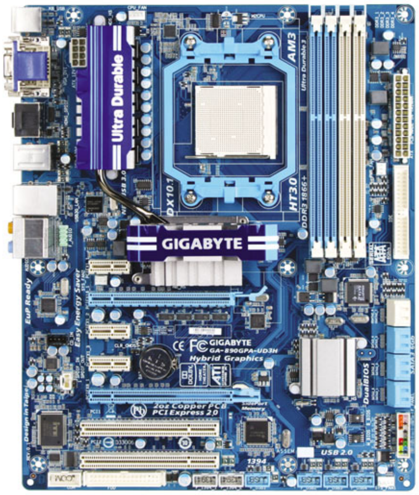
Additionally, the 890GPA-UD3H has a half-dozen 6Gbps SATA 3.0 connections; DualBIOS, which means that there are two physical BIOS ROM chips onboard to provide a backup in the event of a BIOS failure; support for up to six monitors with ATI SurroundView; and 128MB of SidePort memory as well as CrossFire support for two graphics cards.

Although the 890GPA-UD3H has options for more minute control for overclocking, I didn't find much headroom; I got the same overclock results by simply playing with the CPU multiplier than by juggling the many system-wide elements, such as voltages and the HT frequency.

Overall, this is an exciting board, with a tasty helping of future-facing components.

(*Note: For performance results, please see the AMD Phenom II X2 555 Black Edition review on page 31.*)

**by Seth Colaner**



**890GPA-UD3H**
$139.99 | Gigabyte
www.gigabyte.us
●●●●

**Specs:** Socket AM3; 890GX chipset; Max memory: 16GB; Slots: 2 PCI-E x16, 3 PCI-E x1, 2 PCI; Ports: 6 6Gbps SATA, 2 3Gbps SATA, up to 14 USB 2.0, 2 USB 3.0, up to 3 FireWire, 1 Gigabit Ethernet; Video outputs: D-Sub, DVI-D, HDMI

**Test system specs:** CPU: 3.2GHz AMD Phenom II X2 555 BE; RAM: 2GB OCZ DDR3-1333; Graphics: ATI Radeon HD 5750; Hard Drive: 150GB Western Digital Raptor 1500

**CPU RANKING** ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

# Antec ISK300-150

With Intel's Atom D-based Pine Trail and Nvidia's ION platforms now available, it's time to rethink tiny case options. Antec takes a clever spin on Mini-ITX with the ISK300, now outfitted with a 150W power supply about the size of a sliced cheese pack. The PSU sits on the case floor behind the front bezel, cabling back along a cross-support to a power cord plug mounted on the rear panel. Above the PSU sits a removable tray able to hold two 2.5-inch drives. The PSU vents out the right face. Also on this face is an empty placeholder for an 80mm fan plus a preinstalled 80mm TriCool fan connected to a low-medium-high speed switch mounted beside the power plug. If you have a higher-end Mini-ITX board and a half-height card (Antec's case supports one) obstructing cross-chassis airflow, you might want the extra fan.

**ISK300-150**
$99.99
Antec
www.antec.com
●●●●

We found the ISK300-150 to be both quiet and solidly built. For such a small case, this unit has surprisingly little give when you try to twist it. The outside securing latch that holds down your half-height card is double-screwed from two directions, adding peace of mind during transporting. You'll find a mounting hole on the rear face for an optional Wi-Fi antenna (not included). The rubberized base for vertical system use is sturdy and snapless, so you don't have to struggle with removing it. The front face sports recessed power and reset buttons, 3.5mm stereo and mic jacks, two USB ports, and one eSATA port.

We wouldn't recommend running a quad-core rig on a 150W PSU, but early Atom systems often draw less than 50W under load. Pine Trail can keep under 30W, so you have some headroom. Our Intel D945GCLF setup ran with one SSD and one HDD just fine, making the ISK300-150 a smart, tough, and attractive case for the "small-minded." ▲

**Specs**: Material: Steel; PSU: 150W; Bays: 2 2.5-inch internal, 1 slim 5.25-inch external; Slots: 1 half-height; Dimensions: 3.8 x 8.7 x 12.9 inches (HxWxD); Weight: 5.5 lbs.

**by William Van Winkle**

# Cooler Master CM 690 II Advanced

The terms "performance tower" and "sub-$100" don't often mix, but Cooler Master here appeals to all of us who want a lot more functionality for a lot less money. Out of the box, the first word that popped to mind for the CM 690 II Advanced's black steel mesh styling was "Kevlar." But upon lifting it, we knew this wasn't the same build quality as, say, the Stacker series. The biggest danger here is drive vibration, and there is zero provision for extra noise dampening.

But what if you didn't have noisy components and you don't worry about parts shifting because your system never moves? Then you wouldn't miss all of that extra steel, and you'd start to appreciate things such as the bottom 3.5-inch bay cage that can be removed to accommodate a reservoir. You can add up to a 280mm radiator in place of the single preinstalled 140mm fan, and rubberized tube holes are predrilled in the back. An elevated motherboard bed lets you route cables under the board, and a cut-out in the bed matches with a ventilation grate in the side wall for direct cooling. A 120mm fan sits over the eight card slots, the eighth being a perpendicular slot above the usual seven.

**CM 690 II Advanced**
$99
Cooler Master
www.coolermaster-usa.com
●●●●

Cooler Master even throws in grate filters and a graphics card bracket to help support jumbo-sized adapters. In addition to the eSATA port that accompanies the two USB and audio ports near the forward-top edge, there's a cover you can pop off to reveal a SATA drive docking station. If your motherboard supports it, this dock can be hot-swappable. Got 1.8- or 2.5-inch drives? Use the included adapter to mount up to two in a single 3.5-inch bay.

The CM 690 II Advanced delivers huge bang for the buck. If you value a little form with a lot of function, Cooler Master delivers. ▲

**Specs:** Material: Steel, plastic; Motherboard compatibility: ATX, microATX, Mini-ITX; Bays: 4 5.25-inch external, 1 3.5-inch external, 6 3.5-inch internal, 2 2.5-inch internal (from 3.5-inch cage); Fans: Rear: 1 120mm, Front: 1 140mm, Top: 1 140mm; Dimensions: 20.8 x 8.4 x 20.1 inches (HxWxD); Weight: 21 lbs.

**by William Van Winkle**

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◐ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Windows®. Life without Walls™, CyberPower recommends Windows 7

**www.cyberpowerpc.com**

**FREE Liquid Cooling**
on all systems

**Intel® Core™ i7 Processor**
(8MB L3 Cache, 1066Mhz)

| | |
|---|---|
| i7-870 2.93Ghz | $ 1235 |
| i7-860 2.80Ghz | $ 925 |

**Intel® Core™ i5 Processor**

| | |
|---|---|
| i5-750 2.66Ghz | $ 835 |
| i5-670 3.46Ghz | $ 925 |
| i5-660 3.33Ghz | $ 835 |
| i5-650 3.20Ghz | $ 819 |

**Intel® Core™ i3 Processor**

| | |
|---|---|
| i3-540 3.06Ghz | $ 769 |
| i3-530 2.93Ghz | $ 745 |

## Gamer Xtreme 2000

**Intel® Core™ i3-530 Processor**
**Genuine Window 7 Home Premium 64 Bit Edition**

| | |
|---|---|
| MB | Intel® H55 Chipset Mainboard |
| RAM | Corsair® 4GB DDR3 1600 Dual Channel Memory |
| HD | 1TB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD |
| VGA | ATI Radeon™ 5570 1GB Direct X 11 Video Card. |
| CASE | Nzxt M59 Gaming Tower Case w/ 600 W Power Supply |
| | Asetek Liquid Cooling System |

DVD 24X±RW
HD 7.1 600 W
Xtreme Gear*
Xtreme Gear*
FREE Liquid Cooling

**$745**

**Intel® Core™ i7 Processor**
(8MB L3 Cache, 1066Mhz)

| | |
|---|---|
| i7-870 2.93Ghz | $ 1179 |
| i7-860 2.80Ghz | $ 865 |

**Intel® Core™ i5 Processor**

| | |
|---|---|
| i5-750 2.66Ghz | $ 779 |
| i5-670 3.46Ghz | $ 865 |
| i5-660 3.33Ghz | $ 779 |
| i5-650 3.20Ghz | $ 759 |

**Intel® Core™ i3 Processor**

| | |
|---|---|
| i3-540 3.06Ghz | $ 715 |
| i3-530 2.93Ghz | $ 689 |

## Gamer Xtreme 1000

**Intel® Core™ i3-530 Processor**
**Genuine Window 7 Home Premium 64 Bit Edition**

| | |
|---|---|
| MB | Intel® H55 Chipset Mainboard |
| RAM | Corsair® 4GB DDR3-1600 Dual Channel Memory |
| HD | 500 GB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD |
| VGA | NVIDIA® GeForce® GT 220 1GB |
| CASE | Apevia X-Crusier 2 Gaming case with 3 Meters & Controls 420 Watt Power Supply |
| | Asetek Liquid Cooling System |

DVD 24X±RW
HD 7.1 600 W
Xtreme Gear*
Xtreme Gear*
FREE Liquid Cooling

**$689**

CyberPOWER Inc.

# UNLEASH THE POWER

*YOUR UNLIMITED GAMING SOLUTIONS*

**Order Toll Free 800-707-0393**

NVIDIA®, nForce®, GeForce®, SLI™ are trademarks or registered trademarks of NVIDIA Corporation or its subsidiaries in the United States and other countries. CyberPower PCs use genuine Microsoft® Windows® • www.microsoft .com/piracy/howtotell

PC GAMER EDITORS' CHOICE

## Gamer Infinity 8800 Pro SE

**Intel® Core™ i7-930 Processor**
**Genuine Window 7 Home Premium 64 Bit Edition**

| | |
|---|---|
| MB | Intel® X58 Chipset Mainboard |
| RAM | Corsair® 6GB DDR3-1600 Tri Channel Memory |
| HD | 1TB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD |
| VGA | ATI Radeon™ 5870 1GB Direct X 11 Video |
| CASE | NZXT Hades Gaming Tower Case 800 Watt Power |
| | Asetek Liquid Cooling System |

4X Blu-ray Player
24X±RW
HD 7.1 600 W
Xtreme Gear*
Xtreme Gear*
FREE Liquid Cooling

# $1435

**Intel® Core™ i7 Processor**
(8MB L3 Cache, 1066Mhz)

| | |
|---|---|
| Extreme i7-985X 3.46Ghz | $ 2199 |
| i7-960 3.20Ghz | $ 1729 |
| i7-940 2.93Ghz | $ 1569 |
| i7-930 2.66Ghz | $ 1435 |

NEW intel® CORE™ i7 inside™

Faster.
Smarter.

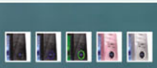
## Gamer Infinity HD 5670

**Intel® Core™ i7-930 Processor**
**Genuine Window 7 Home Premium 64 Bit Edition**

| | |
|---|---|
| MB | Intel® X58 Chipset Mainboard Supporting CrossFireX™/SLI™ |
| RAM | Corsair® 6GB DDR3-1600 Tri Channel Memory |
| HD | 500GB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD |
| VGA | ATI Radeon™ HD5670 512MB Direct X 11 Video Card |
| CASE | Apevia X-Dreamer 3 Gaming Case / 600 Watt Crossfire™ Power |
| | Asetek Liquid Cooling System |

24X±RW
HD 7.1 600 W
Xtreme Gear*
Xtreme Gear*
FREE Liquid Cooling

# $1039



**Intel® Core™ i7 Processor**
(8MB L3 Cache, 1066Mhz)

| | |
|---|---|
| Extreme i7-985X 3.46Ghz | $ 1829 |
| i7-960 3.20Ghz | $ 1345 |
| i7-940 2.93Ghz | $ 1179 |
| i7-930 2.66Ghz | $ 1039 |

## Gamer Xtreme 3000

**Intel® Core™ i3-530 Processor**
**Genuine Window 7 Home Premium 64 Bit Edition**

| | |
|---|---|
| MB | Intel H55 Chipset Mainboard |
| RAM | Corsair® 4GB DDR3-1600 Dual Channel Memory |
| HD | 1TB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD |
| VGA | NVIDIA® GeForce® GTS 250 1GB |
| CASE | ThermalTake Element T Tower Case 600 Watt Power |
| | Asetek Liquid Cooling System |

24X±RW
HD 7.1 600 W
Xtreme Gear*
Xtreme Gear*
FREE Liquid Cooling

# $779

**Intel® Core™ i7 Processor**
(8MB L3 Cache, 1066Mhz)

| | |
|---|---|
| i7-870 2.93Ghz | $ 1269 |
| i7-860 2.80Ghz | $ 955 |

**Intel® Core™ i5 Processor**

| | |
|---|---|
| i5-750 2.66Ghz | $ 869 |
| i5-670 3.46Ghz | $ 955 |
| i5-660 3.33Ghz | $ 969 |
| i5-650 3.20Ghz | $ 855 |

**Intel® Core™ i3 Processor**

| | |
|---|---|
| i3-540 3.06Ghz | $ 799 |
| i3-530 2.93Ghz | $ 779 |

## Gamer Xplorer X5-7800

**Intel® Core™ i3 330M Processor**
Intel® HM55 Chipset
Intel® WiFi Link 5300 802.11 A/G/N

**Genuine Window 7 Home Premium 64 Bit Edition**
4GB DDR3 PC1333 Memory
320GB SATA150 Hard Drive
15.6" WXGA TFT Display 1366x768 pixels
8X DVD+/-RW Drive
1000/100/10 Network Card & 56K V.92 Fax/Modem
ATI Mobile Radeon™ HD 4300 512MB
3-in-1 Built-in Media Reader
1 HDMI Port, 1 IEEE-1394 Firewire Port
3x USB 2.0 Ports, 1 PCMCIA Type II Slot
3 Hours Battery Life, Weight only 6.8 Lbs
Free Carrying Case, 6 Custom Colors to Choose From

# $869

**Intel® Core™ i7 Processor**
(1333/1066Mhz)

| | |
|---|---|
| 820QM 8MB 1.73Ghz | $ 1259 |
| 720QM 6MB 1.60Ghz | $ 1065 |
| (1066Mhz, L3 Cache) | |
| 620M 4MB 2.66Ghz | $ 1029 |

**Intel® Core™ i5 Processor**
(733Mhz, L3 Cache)

| | |
|---|---|
| 540M 3MB 2.53Ghz | $ 945 |
| 520M 3MB 2.40Ghz | $ 899 |

**Intel® Core™ i3 Processor**
(667Mhz, L3 Cache)

| | |
|---|---|
| 330M 3MB 2.13Ghz | $ 869 |

## Gamer Xplorer X7-7700

**Intel® Core™ i5 520M Processor**
Intel® PM55 Chipset
Intel® WiFi Link 5300 802.11 A/G/N

**Genuine Window 7 Home Premium 64 Bit Edition**
4GB DDR-3 PC1333 Memory
500GB SATA150 Hard Drive
17" WSXGA TFT Display 1680x1050 pixels
8x DVD+/-RW Drive
1000/100/10 Network & 56K V.92 Fax/Modem
NVIDIA® GeForce® GTS 250M 1GB
3-in-1 Built-in Media Reader, 1 HDMI Port, 1 Firewire Port
IEEE-1394 & 3x USB 2.0 Ports, 1 PCMCIA Type II Slot
3 Hours Battery Life, Weight only 7.6 Lbs
Free Carrying Case

# $1299

**Intel® Core™ i7 Processor**
(1333/1066Mhz)

| | |
|---|---|
| Extreme 920XM | $ 2259 |
| 820QM 8MB 1.73Ghz | $ 1665 |
| 720QM 6MB 1.60Ghz | $ 1469 |
| (1066Mhz, 900Mhz, L3 Cache) | |
| 620M 4MB 2.66Ghz | $ 1429 |

**Intel® Core™ i5 Processor**
(733Mhz, L3 Cache)

| | |
|---|---|
| 540M 3MB 2.53Ghz | $ 1349 |
| 520M 3MB 2.40Ghz | $ 1299 |

All Desktop systems come with 3 year Limited Warranty + lifetime toll free techsupport

Celeron, Celeron Inside, Centrino, Centrino Inside, Centrino Logo,Core Inside, Intel, Intel Logo, Intel Core, Intel Inside, Intel Inside Logo, Intel Viiv, Intel vPro, Itanium, Itanium Inside, Pentium, Pentium Inside, Viiv Inside, vPro Inside, Xeon, and Xeon Inside are trademarks of Intel Corporation in the U.S. and other countries. All prices are subject to change without notice or obligation. CyberPower is not responsible for any typographical and photographic errors. Copyright ©2008 CyberPower. All rights reserved.

CyberPOWER Inc.

# NZXT Hades

NZXT's Crafted Series of enclosures consists of the company's more outlandish designs; the Nemesis Elite and Guardian 921 come to mind. The Hades, although also somewhat unconventional in its design, is a bit more subdued than some of its counterparts, despite belonging to the same product family.

The Hades is a steel midtower chassis that is completely black—inside and out—with lighted red fans and LED readout at the top that displays temperatures gathered from the Hades' three included thermal probes. The door swings open to reveal four external 5.25-inch bays, a reset switch, and a couple of knobs which can be used to adjust the speed on two of the case's intake fans. The side panel includes a lighted 200mm fan, and all drive bay covers, expansion slot covers, and the door are made of a metal mesh to maximize airflow. We should also note that all intake fans and drive bay covers feature fan filters to keep dust out of the case.

Working in the NZXT Hades was a mixed bag. The case isn't completely tool-less and is a bit cramped at the top due to the position of the uppermost cooling fan. We had to mount our hard drives into adapters before securing them in a 5.25-inch bay, which is a pain, but the upside is that the adapters feature rubber grommets to isolate vibration.

**Hades**
$99
NZXT
www.nzxt.com
●●●●

The motherboard tray isn't removable, but NZXT does make it easy to route cables neatly in the Hades, thanks to pre-existing holes throughout the case.

If you dig the Hades' unique design, it offers a number of useful features normally reserved for much more expensive products. For under a hundred bucks, this case is definitely worthy of consideration. ▲

**Specs**: Materials: Steel, plastic; Motherboard support: E-ATX, ATX, MicroATX, Baby AT; Drive Bays: Up to 9 5.25-inch (4 External), 4 3.5-inch Internal; Expansion slots: 7; Dimensions: 16.9 x 7.87 x 19.7 inches (HxWxD); Weight: 15.32 lbs.; Fans: Front: 1 200mm, Rear: 1 120mm, Side: 1 200mm, Top: 1 140mm

**by Marco Chiappetta**

# Zalman CNPS10X Performa

We've already looked at three of Zalman's CNPS10X coolers (see pages 21, 33, and 28 of the November 2009, February 2010, and March 2010 issues, respectively) and found them all to be respectable performers. The Performa, however, while also a decent performer, seems to be the better value.

The Zalman CNPS10X Performa features a tower-type aluminum heatsink fin configuration with a solid copper base. The heatsink fins are linked to the base via five copper heatpipes. The unit includes one 120mm fan, and there are hooks to add a second. (We tested the Performa with a single fan.) A simple fan controller of sorts called the RC24P, which consists of little more than a power extension cable with an in-line resistor, is included with the Performa, too. When in place, the RC24P results in a slower fan speed, and hence lower noise output, although the stock fan is quiet even without the RC24P.

**CNPS10X Performa**
$30
Zalman
www.zalmanusa.com
●●●◖

Installation is somewhat complex due to the multiple types of mounting brackets included. But once in place, the Performa remains mounted solidly. Its performance, when tested on our Core i7-965-based test bed, far exceeded Intel's stock heatsink and fan, and temperatures while overclocked to almost 4GHz were well within comfortable limits.

With an expected street price near the $30 mark, the CNPS10X Performa is a great all-around cooler. In its stock form, the Performa should please quiet-computing and mainstream users, while enthusiasts can opt for a dual-fan configuration for extreme performance. ▲

| Benchmark Results | Intel Stock HSF | Zalman CNPS10X Performa Stock/OC |
|---|---|---|
| Idle* | 42 | 38/40 |
| Load* | 69 | 64/78 |

**Test System Specs:** Intel Core i7 965 Extreme (3.2GHz stock, 3.9GHz overclocked), Gigabyte EX58-UD5, 6GB OCZ Reaper DDR3-1333, Windows 7 Ultimate x64

*Results in degrees Celsius

**Specs**: Compatibility: Intel Sockets 1366/1156/775, AMD Sockets AM3/AM2+/AM2/940/939/754; 748g; Materials: Aluminum (fins), copper (base); Fan: 4-pin 120mm PWM; Fan speeds: 900 to 1,350rpm (RC24P connected), 900 to 2,000rpm (RC24P not connected); Noise: 17 to 24dBA (RC24P connected), 17 to 36dBA (RC24P not connected)

**by Marco Chiappetta**

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

# White Paper:
# Nvidia Optimus

## The Way It's Meant To Be Switched

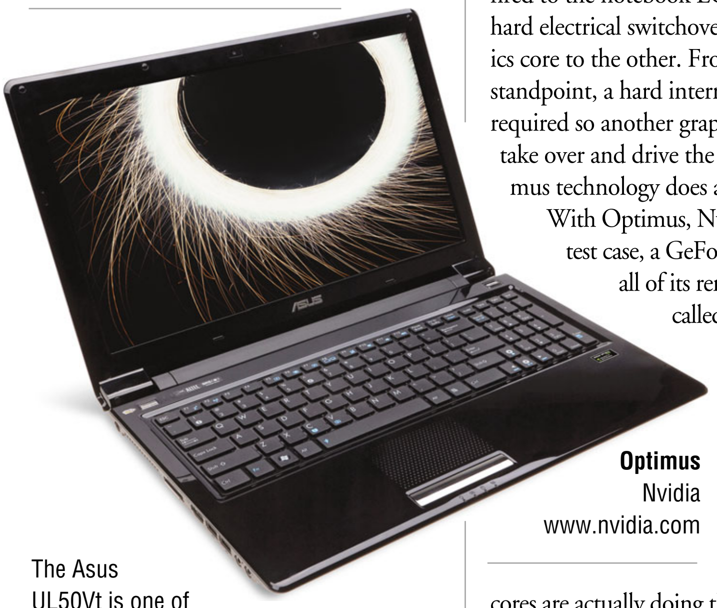
Only a select few notebooks have ever come to market with hybrid "switchable graphics." The ability to manually switch between low-power integrated graphics solutions in the notebook chipset to more powerful, high-performance discrete GPUs was usually reserved for higher-end thin-and-light machines. To power users, switchable graphics seemed like nirvana. The IGP was used to conserve battery life when horsepower wasn't necessary, while the discrete GPU was available for more demanding tasks, such as gaming or HD video.

In reality, however, notebooks with switchable graphics weren't all they were cracked up to be. In many cases, you had to flip a physical switch, close applications, and restart the system to go from discrete graphics to IGP and vice versa.

Ideally, switchable graphics should be seamless. Launch an application that doesn't require significant GPU resources, and the IGP handles the graphics. Fire up a game, though, and the discrete GPU kicks in—no buttons, no flickering of the display, no need to reboot. Finally, Nvidia's new Optimus graphics technology for notebooks makes this a reality.

Switchable graphics used to work by employing a series of muxes that would combine outputs of both the IGP and the discrete GPU over the same display output lines on the PCB. The output was then fired to the notebook LCD. This required a hard electrical switchover from one graphics core to the other. From a software standpoint, a hard interrupt of the OS was required so another graphics core could take over and drive the UI. Nvidia's Optimus technology does away with this.

With Optimus, Nvidia's GPU (in our test case, a GeForce G210M) passes all of its render data, when called upon, to the integrated graphics core, which then passes it on for output to the display. The graphics engines only have to switch which graphics cores are actually doing the work at the time, but the IGP in the chipset is always driving the output to the panel. Although the technology is proprietary to Nvidia, the company has noted that its GPUs as far back as the GeForce G2XX mobile chips as well as future mobile GPUs have what's called the Optimus Copy Engine, which has the sole purpose of passing data from local graphics memory up to the chipset IGP for output to the display. This lets the GPU keep on task with its workload without having to play data transfer traffic cop. The result of this architectural approach is that there is no loss in performance in discrete graphics mode, but the discrete GPU can also be completely powered down when not required.



The Asus UL50Vt is one of the first notebooks with Nvidia's Optimus technology. It switches from its integrated Intel graphics chipset to its discrete Nvidia GeForce G210M GPU automatically, on the fly, as needed for gaming or otherwise, then switches back off when not needed.

**Optimus**
Nvidia
www.nvidia.com

There is a bit of "special sauce" in order to fool the IGP into displaying the output from the discrete GPU, and Nvidia achieves this in hardware and in software, where application and game profiles will trigger the discrete GPU to kick into gear when needed. Nvidia keeps a database of supported titles and apps that is continually updated and pushed to your driver database on the notebook, but you can also specify which processor core is used via a simple profile menu in the driver control panel.

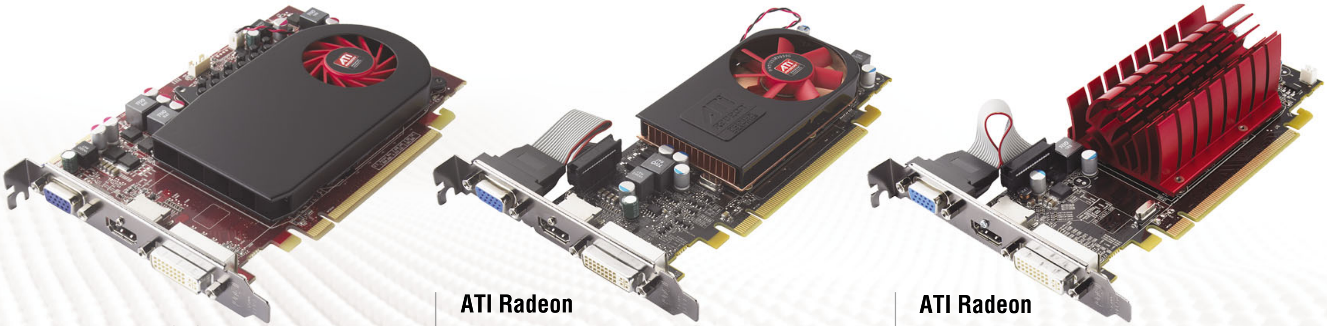
Essentially, what this drop-down menu does, beyond listing dozens of top gaming titles, is to give you control over any application or game that is on your machine and let you specify which graphics core will do the render work for display on your notebook. So, for example, perhaps your notebook's IGP is capable enough to run World of Warcraft and you want to conserve battery life; you can set it to always run just on the IGP. Conversely, if you'd rather have your Nvidia GeForce GPU do the work on HD video playback, you can set Windows Media Player to always default to the GPU. It's a set it and forget it sort of approach that works quite well. The good news is you'll never have to flip a switch, close an application you're running, or reboot the machine again to switch modes. Nvidia's Optimus technology just knows what to do and when to do it. It's the way switchable hybrid graphics for notebooks should have worked all along.

Currently, Optimus technology is only available on certain notebook models from Asus, but you can be sure Nvidia will be announcing more than a few design wins on their new technology in the coming months. ▲

**by Dave Altavilla**

# AMD ATI Radeon HD 5670, 5570 & 5450

## Cypress Has Triplets



**ATI Radeon HD 5670**
$99 to $119
AMD • ati.amd.com
●●●●

**Specs:** GPU: Redwood XT; Core clock: 775MHz; Memory: 512MB GDDR5 (1,000MHz); 400 shader processors, 20 texture units, eight ROPs

**ATI Radeon HD 5570**
$79 to $89
AMD • ati.amd.com
●●●●◖

**Specs:** GPU: Redwood Pro; Core clock: 650MHz; Memory: 1GB DDR3 (900MHz); 400 shader processors, 20 texture units, eight ROPs

**ATI Radeon HD 5450**
$49 to $59
AMD • ati.amd.com
●●●◖

**Specs:** GPU: Cedar; Core clock: 650MHz; Memory: 512MB DDR3 (900MHz); 80 shader processors, eight texture units, four ROPs

AMD's graphics division has been firing on all cylinders lately. The ATI Radeon HD 5670, 5570, and 5450 are all based on the Cypress GPU that we revealed several months ago, and as such, they all support the same features, including DirectX 11, Eyefinity, and the latest ATI Stream specs. They also support the same technologies found in previous generation Radeon HD cards, including CrossFire, UVD 2, PowerPlay, and more.

Although these GPUs aren't record breakers, what they represent for AMD is nothing short of stunning—complete top-to-bottom market dominance. Having affordable cards on the shelves is one thing, but who wants to buy them? If 25 million active Steam accounts are any indication, then almost everybody does. According to the January 2010 Steam Hardware Survey, more than 83% of gamers using the service play primarily at resolutions of 1,680 x 1,050 or less, which is the sub-$100 graphics card sweet spot. Read on to see if there's a Redwood- or Cedar-based card in your very near future.

### AMD ATI Radeon HD 5670

The castrato version of the Redwood XT we tested, better known as the ATI Radeon HD 5670, lacks the CrossFire connector and comes with 512MB of memory. Even without the connector, this card still supports CrossFire, but the data exchange all happens over the PCI-E interface. To date, the Radeon HD 5670 is the least expensive card in the 5000 series that will benefit from GDDR5 and its double data rate. AMD equipped this GPU with a 128-bit memory bus and memory clocked at 1GHz, for a total 4Gbps throughput. To give you some perspective for what a hundred dollars will buy you, the 627 million-transistor GPU inside the Radeon HD 5670 consists of five SIMD engines, which is a quarter of those found in the flagship Radeon HD 5870. That works out to 400 stream processors, 20 texture units, and eight ROPs.

The card we tested features a full-height, single-slot form factor and DisplayPort, HDMI, and DVI ports. The heatsink and fan combo covers about three-quarters of the board and vents heat inside the case, but with peak and idle power draw rated at 64W and 15W, respectively, heat is not a problem. With such a low TDP, AMD was able to forgo a supplemental power connector on the board. If the Radeon HD 5670 is anything like its last generation counterpart, expect this card to be wearing a variety of dual-slot coolers when you see it on store shelves.

### AMD ATI Radeon HD 5570

The Redwood Pro, or Radeon HD 5500, is built using the same GPU found in the Redwood XT. As a result, many of the specs for this card mirror those of the Radeon HD 5670. Its GPU consists of 627

**CPU RANKING** ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

million transistors and features five SIMD engines, 400 stream processors, 20 texture units, and eight ROPs. It also has a similar memory subsystem, with a 128-bit bus; however, the Radeon HD 5570 we tested ships with 1GB of DDR3 clocked at 900MHz, which affords it a data rate of 1.8Gbps. The core clock is set to 650MHz. Like other 5000 series cards, the 5500 supports Eyefinity and DX11, but these features demand a lot from the GPU, so this card isn't a compelling option for those looking into the latest games and multi-monitor resolutions. CrossFire is also supported on this card over the PCI-E slot.

This card features a half-height form factor and has a DVI, HDMI, and VGA port on the full-height bracket. The active cooler on this card is considerably smaller than that of the 5670, covering GPU and memory chips. We wouldn't be surprised to see this card sporting a passive cooler in retail. The 5570's power draw is a cool 40W under load and 10W at idle.

## AMD ATI Radeon HD 5450

In the bargain bin, we find ATI's 292 million-transistor Cedar GPU, which forms the basis for the Radeon HD 5450. This card features a single SIMD engine, or 1/20 the pixel-crunching horsepower found in the RV870. That gives this card 80 stream processors, eight texture units, and four ROPs. But memory performance for the Radeon HD 5450 is also constrained due to the fact that it runs DDR3 and comes with a narrow 64-bit memory bus. The card we tested had 512MB of memory clocked at 900MHz and a core clock set to 650MHz. AMD informed us that cards on store shelves could have memory clocked as low as 800MHz, which the firm estimates gives our sample up to a 5.5% performance advantage over a sample with memory clocked at 800MHz. Like the other cards covered here, the Radeon HD 5450 supports CrossFire over the PCI-E slot.

Our Radeon HD 5450 is a half-height card that includes DVI, HDMI, and VGA ports. The card will also ship supporting the DisplayPort interface. The cooler is a red-anodized block of aluminum that covers approximately two-thirds of the card. The 5450 power draw is a frosty 19.1W under load and 6.4W at idle.

## Final Word

In our tests, the Radeon HD 5670 absolutely crushed the DX9 Left 4 Dead, even at 1,920 x 1,200. It also managed playable frame rates in the DX10 Far Cry 2 benchmark, though just barely at the higher resolution. The Radeon HD 5670 didn't fare as well in Dirt 2's DX11 test, but decreasing a few settings should let you enjoy some DX11 visuals at 1,280 x 1,024. This is an ideal choice for those looking for a gaming graphics card that won't break the bank.

Although the Radeon HD 5570 looks like a nerfed 5670, we feel this is actually the strongest product of the bunch. It will let you play games at low and medium resolutions, costs reasonably less than the 5670, and features a form factor and TDP that make it an excellent option for HTPCs and light gaming rigs.

The Radeon HD 5450 is not for gaming but is more than capable of BD playback acceleration and Dolby TrueHD. DTS-HD Master Audio bit streaming over HDMI make this a no-brainer for the home-theater crowd. ▲

**by Andrew Leibman**

## Specs & Scores

| | Radeon HD 5450 | Radeon HD 5570 | Radeon HD 5670 |
|---|---|---|---|
| Price | $49 to $59 | $79 to $89 | $99 to $119 |
| Core clock | 650MHz | 650MHz | 775MHz |
| Memory clock | 900MHz* | 900MHz | 1,000MHz |
| Memory | 512MB DDR3 | 1GB DDR3 | 512MB GDDR5 |
| Memory bus | 64-bit | 128-bit | 128-bit |
| Stream processors | 80 | 400 | 400 |
| Texture units | 8 | 20 | 20 |
| ROPs | 4 | 8 | 8 |
| Transistors (millions) | 292 | 627 | 627 |
| TDP | 19.1W | 42.7W | 61W |
| **3DMark Vantage** | **Performance (1,280 x 1,024)** | | |
| Overall | P1342 | P4241 | P5817 |
| GPU Score | 1041 | 3552 | 5085 |
| GPU1 (fps) | 2.73 | 10.72 | 15.16 |
| GPU2 (fps) | 3.38 | 10.08 | 14.63 |
| CPU Score | 10186 | 10145 | 10237 |
| CPU1 (Plans/s) | 1313.84 | 1319.17 | 1322.58 |
| CPU2 (Steps/s) | 15.9 | 15.57 | 15.93 |
| **3DMark Vantage** | **Entry (1,024 x 768)** | | |
| Overall | E6834 | E15429 | E17987 |
| GPU Score | 6140 | 18615 | 23975 |
| GPU1 (fps) | 16.45 | 60.59 | 75.42 |
| GPU2 (fps) | 19.57 | 48.26 | 64.86 |
| CPU Score | 10339 | 10194 | 10282 |
| CPU1 (Plans/s) | 1320.31 | 1316.59 | 1326.18 |
| CPU2 (Steps/s) | 16.48 | 15.88 | 16.06 |
| **Games** | **1,280 x 1,024** | | |
| Far Cry 2 | 12.78 | 31.2 | 40.34 |
| Left 4 Dead (2XAA, 4XAF) | 19.71 | 54.62 | 74.07 |
| Dirt 2 (8XAA) | N/A | 18.6 | 23.6 |
| | **1,920 x 1,200** | | |
| Far Cry 2 | 9.27 | 24.08 | 31.37 |
| Left 4 Dead (2XAA, 4XAF) | 12.52 | 35.91 | 49.16 |
| Dirt 2 (8XAA) | N/A | 14.8 | 13.1 |

**Driver: ATI Catalyst 10.1**
**Test system specs:** 3GHz Phenom II X4 940, Biostar TA790GX 128M (AMD 790GX + SB750), Crucial 4GB DDR2-800, Corsair HX1000W PSU, 1TB Western Digital Caviar Black HDD, Windows 7

*As tested. Retail version memory clock rated at 800MHz.

## Gamer Paladin D805

- Intel® Core™ i3-530 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Intel® H55 Chipset Motherboard
- NVIDIA® GeForce™ GT 220 1GB Video Card
- iBUYPOWER A235 Gaming Case + 450W Power Supply
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound

**$699**

DVD±RW 24x DVD | MEMORY 4GB CORSAIR DDR3-1333 | HARD DRIVE 1TB SATA-II | KEYBOARD MOUSE | SPEAKERS

Components included with system

| | |
|---|---|
| Intel® Core™ i7-870 Processor | $1154 |
| Intel® Core™ i5-860 Processor | $864 |
| Intel® Core™ i5-750 Processor | $779 |
| Intel® Core™ i5-670 Processor | $869 |
| Intel® Core™ i5-660 Processor | $784 |
| Intel® Core™ i5-650 Processor | $764 |
| Intel® Core™ i3-540 Processor | $719 |
| Intel® Core™ i3-530 Processor | $699 |

## Gamer Paladin D825

- Intel® Core™ i3-530 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Intel® H55 Chipset Motherboard
- ATI® Radeon™ HD 5570 1GB Video Card - DirectX 11 Support
- PSI CyborgX Gaming Case + 700W Certified Power Supply
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound

**$769**

DVD±RW 24x DVD | MEMORY 4GB CORSAIR DDR3-~~1333~~ 1600 | HARD DRIVE 1TB SATA-II | KEYBOARD MOUSE | SPEAKERS

Components included with system

| | |
|---|---|
| Intel® Core™ i7-870 Processor | $1239 |
| Intel® Core™ i5-860 Processor | $934 |
| Intel® Core™ i5-750 Processor | $849 |
| Intel® Core™ i5-670 Processor | $944 |
| Intel® Core™ i5-660 Processor | $854 |
| Intel® Core™ i5-650 Processor | $834 |
| Intel® Core™ i3-540 Processor | $789 |
| Intel® Core™ i3-530 Processor | $769 |

## Gamer Paladin D845

- Intel® Core™ i7-920 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Asus® P6T SE Intel® X58 Chipset Motherboard
- NVIDIA® GeForce™ GTS 250 1GB Video Card
- Chimera Inferno 2 Gaming Case + 700W Power Supply
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound

**$1149**

DVD±RW 24x DVD | MEMORY 6GB CORSAIR DDR3-1333 | HARD DRIVE 1TB SATA-II | KEYBOARD MOUSE | SPEAKERS

Components included with system

| | |
|---|---|
| Intel® Core™ i7-975 Processor Extreme Edition | $1949 |
| Intel® Core™ i7-960 Processor | $1449 |
| Intel® Core™ i7-920 Processor | $1149 |

## Gamer Paladin D865

- Intel® Core™ i7-920 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Asus® P6T SE Intel® X58 Chipset Motherboard
- ATI® Radeon™ HD 5770 1GB Video Card - DirectX 11 Support
- NZXT® Guardian 921 Gaming Case + 700W Power Supply
- Intel® 40GB SSD (Boot) + 1TB HDD (Data)
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound

| | |
|---|---|
| Intel® Core™ i7-975 Processor Extreme Edition | $2089 |
| Intel® Core™ i7-960 Processor | $1599 |
| Intel® Core™ i7-920 Processor | $1299 |

**$1299**

DVD±RW 24x DVD | MEMORY 6GB CORSAIR DDR3-~~1333~~ 1600 | KEYBOARD MOUSE | SPEAKERS

Components included with system

## Gamer Paladin D885

- Intel® Core™ i7-920 Processor
- Genuine Windows® 7 Home Premium 64-Bit Edition
- Asus® P6T SE Intel® X58 Chipset Motherboard
- ATI® Radeon™ HD 5870 1GB Video Card - DirectX 11 Support
- Thermaltake V9 Green Gaming Case + 800W SLI™ Certified Power Supply
- Intel® 40GB SSD (Boot) + 2TB HDD (Data)
- Liquid CPU Cooling System with 120mm Radiator
- High Definition Surround 3D Premium Sound

**$1759**

BLU-RAY 8x BD-RE | MEMORY 12GB CORSAIR DDR3-~~1333~~ 1600 | KEYBOARD MOUSE | SPEAKERS

Components included with system

| | |
|---|---|
| Intel® Core™ i7-975 Processor Extreme Edition | $2539 |
| Intel® Core™ i7-960 Processor | $2059 |
| Intel® Core™ i7-920 Processor | $1759 |

**Toll Free: 888-462-3899 | www.ibuypower.com**

Intel, the Intel logo, Intel Core and Core Inside are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

iBUYPOWER Recommends Windows® 7 Home Premium

# GRAB YOUR GEAR
# Prepare For Battle

NEW
intel® CORE™ i7 inside™
Faster.
Smarter.

FREE LIQUID COOLING 120mm ALL DESKTOPS

Zalman GS1000 Plus
Thermaltake Level 10

**$999**

Intel® Core™ 2 Duo Processor (1066MHz FSB)

| | |
|---|---|
| • T9900 (6MB L2 Cache, 2.93GHz) | $1364 |
| • T9600 (6MB L2 Cache, 2.66GHz) | $1119 |
| • P9700 (6MB L2 Cache, 2.66GHz) | $1159 |
| • P8800 (3MB L2 Cache, 2.53GHz) | $1039 |
| • P8700 (3MB L2 Cache, 2.40GHz) | $999 |

## Battalion Touch CZ-10

- Intel® Core™ 2 Duo Mobile Processor Technology
  - Intel® PM45 Chipset
  - Intel® WiFi Link 5300 Wireless 802.11 a/b/g/n
- GENUINE Windows® 7 Home Premium 64-Bit Edition
- 15.6" WXGA 1366 x 768 Touch Screen Display
- 2GB DDR3-1333 Memory
- 250GB S-ATA Hard Drive
- ATI® M96 Mobility Radeon™ HD 4650 with 512MB Video Card
- Removable 8x DVD±R/±RW Drive
- Built-in 2.0 Mega Pixels Digital Camera
- GB Ethernet LAN & 56K Modem
- 3x USB 2.0 Ports; 1x HDMI Port
- 3-in-1 Built-in Media Card Reader
- Free Deluxe Carrying Case

## Introducing the World's First Multi-Touch Gaming Notebook

Interactive Gaming
Photo Organization
Touch Screen Play

Touch

Toll Free: 888-462-3899

iBUYPOWER

www.ibuypower.com

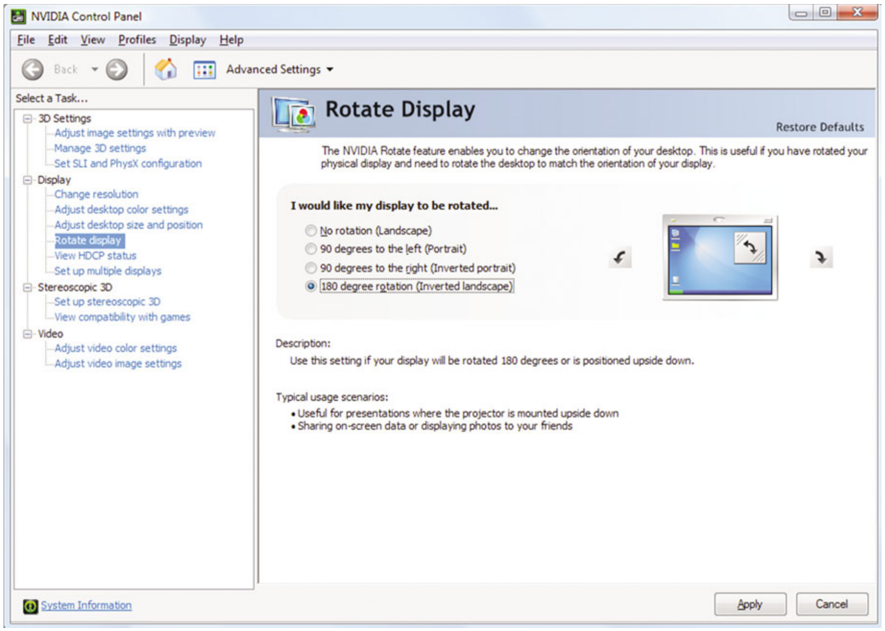
# Silicon Shenanigans

## April Fool's Mods For Mischievous Power Users

We tend to be a serious bunch here at *CPU*. When deadlines are looming, embargos are about to lift, and there are still many hours of testing left to do before we can even begin formulating an opinion on a product—let alone write a single word—things can be pretty stressful. Repeat that process multiple times every month, and it's easy to see why we're not always the happy-go-lucky types around the office. But underneath our gruff exteriors, we're still kids at heart. (Well, at least some of us are anyway.)

There are occasions, however, when we get a little downtime, the pressure is off, and we can be our laid-back selves. During those times, lots of fun stuff goes on around here, from late-night gaming sessions to experimental modding. And we even get to play practical jokes on each other on occasion. Did we ever tell you about the time Chris took Vince's mouse and dipped it in . . . wait a second . . . we better keep that one to ourselves for just a little longer. We don't want you all getting the wrong idea.

Speaking of ideas, while brainstorming for topics for the April issue a few months back, something dawned on us. We haven't paid homage to one of the greatest pseudo-holidays in all the world, April Fool's Day. So, in the spirit of April Fool's Day, we're dedicating this month's mods to all of the mischievous enthusiasts out there ready to pull off some sneaky pranks on their PC-using co-workers, loved ones, or friends. We're not going to cover anything mean or malicious mind you, but rather just a handful of fun, quick mods that are sure to get a laugh, if the recipients don't smash their monitors or throw their computers out the window, that is.



The NVIDIA Rotate feature enables you to change the orientation of your desktop. This is useful if you have rotated your physical display and need to rotate the desktop to match the orientation of your display.

I would like my display to be rotated...

○ No rotation (Landscape)
○ 90 degrees to the left (Portrait)
○ 90 degrees to the right (Inverted portrait)
● 180 degree rotation (Inverted landscape)

Description:
Use this setting if your display will be rotated 180 degrees or is positioned upside down.

Typical usage scenarios:
- Useful for presentations where the projector is mounted upside down
- Sharing on-screen data or displaying photos to your friends

Rotating someone's display 180 degrees can be done in a few seconds with only a few mouse clicks. The driver panel seen here is from Nvidia, but display rotation options are available within Intel and ATI graphics drivers, too.

### Digital Disorientation

Picture this: Your co-worker walks away from his workstation to grab a cup of coffee, comes back, wakes up his system, and everything on the screen is suddenly inverted 180 degrees (or, for the geometrically challenged, everything's upside down). That alone will make some users pause and do a major double take, but the real fun comes from watching him try to use his mouse to figure out the problem; when the screen is inverted, so are all of the mouse movements. It's definitely disorienting and will take at least a few minutes to navigate through a few driver menus in order to right the display.

Pulling this mod off is quick and easy. All of the major players in graphics—Intel, Nvidia, and ATI—have options within their drivers to rotate a display. On a system powered by an Intel GPU, right-click a blank part of the Desktop and in the context menu, select Graphics Options, then Rotation, and then click the desired degree of rotation. If the system has an Nvidia GPU, open the Nvidia control panel, and in the left pane labeled "Select A Task...," click the plus (+) sign to expand the tree in the Display section and then select the Rotate Display option. The right pane will update with the Rotate Display options menu, where you'll be able to select a degree of rotation. Finally, the option in ATI's Catalyst Control Center can be found in the Desktop & Displays subsection of the Graphics properties menu. Open CCC, click the drop-down menu at the upper-left labeled Graphics, and then select Desktop & Displays. You'll see a visual representation of all of the displays connected to the system. Click the black triangle at the upper right of the display

Sticking a piece of tape over the sensor on an optical mouse, even if the tape is clear, will render the mouse useless. For a little more lively effect, stick the piece of tape over half the sensor and enjoy the erratic dance of the cursor whenever the mouse is moved.

you'd like to rotate, select Rotate from the menu, and choose the desired orientation.

After everyone's had a good laugh, simply go back into the necessary control panel and reset the proper orientation to make everything right again. And here's a useful tip: If you're too discombobulated from the rotated display to properly control the mouse, just flip the entire monitor over.

## Frozen In Time

As simple as it is, this has to be one of our all-time favorite practical jokes to play on a fellow PC user. The effect is that of a frozen system, but in reality nothing has really gone wrong at all. To start, take a screen shot of the user's Desktop by pressing the PRINT SCREEN key, then open MS Paint, and Paste the image into the document. Save the file as a BMP or JPG, and you now have an image of the user's full Desktop. Next, place all of the user's desktop icons in a folder and move them somewhere safe, such as the My Documents folder, and then move the user's Start menu to the top of the screen. To move the Start menu, simply click a black portion of the Taskbar and drag it to the top of the display. Then, right-click the Taskbar, select Properties from the menu, click the Taskbar tab at the top in the window that opens, and set the Taskbar to auto-hide. Finally, set the screen shot you took of the user's Desktop as the Desktop wallpaper. When you're done, the system will appear to be sitting at the Desktop, but when the user tries to click on any of the folders or buttons, nothing will happen because he's actually clicking only on the Desktop wallpaper! The icons have all been moved.

Please, take our word for it and do not attempt this trick on a user who is in the middle of an important project. Otherwise, because the first response is typically to shut down the machine, when it restarts, the system will still appear to be frozen. Get in a good laugh as you let your buddy squirm for a bit before you jump up from behind your cube and yell, "April Fools!" Keep your guard up, just in case.

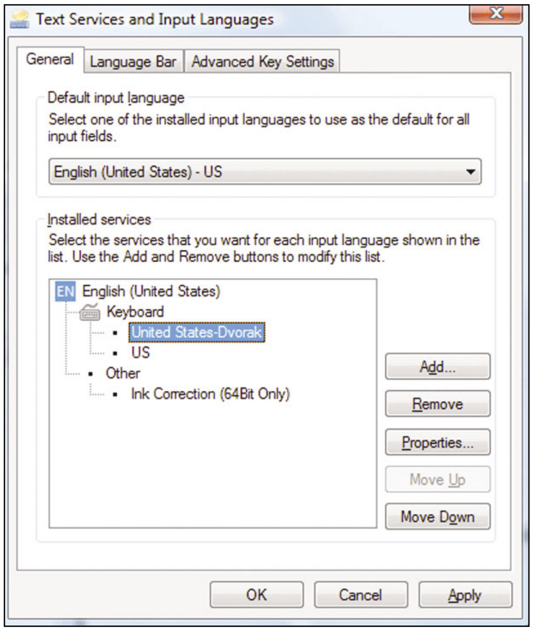
## Mouse Mayhem

It is so difficult for most users to navigate around a PC without using a mouse that the slightest mouse problem will give them fits. Many old-schoolers are perfectly comfortable using only keyboard shortcuts, but they are a dying breed.

One of the quickest and easiest tricks to play on someone is to simply put a piece of clear tape over the sensor on their mouse. If you want to be extra precise and cut the piece of tape to perfectly fit the sensor, that's great, and it will be all the more undetectable, but simply sticking a piece of tape to the bottom will do the trick. In most cases, the mouse will be completely useless. The cursor won't move at all.

A variation on this prank is to place the piece of tape over only a portion of the sensor. If you can position the edge of the tape directly over the center of the mouse sensor, instead of killing cursor movement completely, the cursor will instead jump around erratically, sometimes working properly, other times zigzagging all over the screen.

If you prefer to take things even further and are comfortable running an application on the prankee's computer, download a copy of SakasaMouse 1.03.



Default input language

Select one of the installed input languages to use as the default for all input fields.

English (United States) - US

Installed services

Select the services that you want for each input language shown in the list. Use the Add and Remove buttons to modify this list.

- EN English (United States)
  - Keyboard
    - United States-Dvorak
    - US
  - Other
    - Ink Correction (64Bit Only)

One of the quickest ways to drive a PC user insane is to change his keyboard layout. There's no spell checker in the world that will catch all of the typos.

SakasaMouse is a tiny, free download that doesn't require any installation. Simply run the program, and it will immediately invert all mouse cursor movements. To shut SakasaMouse off, all you'll need to do is exit the application via its Systray icon, but just getting there to do so will be a pain.

## Keyboard Capers

Although just as simple as the rest of our shenanigans, this prank has the potential to go unnoticed for the longest time and may very well cause the most frustration. It involves changing the keyboard layout for a system through a few control panel tweaks. On the surface, nothing will appear wrong with the system. But as the user types, he or she will be greeted by a slew of typos and other mistakes because the affected keystrokes won't produce the desired results.

Go to the system's Control Panel and open the Clock, Language, and Region menu. In the Regional And Language options section, click the link for Change Keyboards Or Other Input Methods, and the Regional And Language dialog box will pop up. Click the Keyboard And Languages tab and then click on the Change Keyboards button. The Text Services And Input Languages menu will appear. In the Installed Services section at the bottom of the window, highlight the Keyboard listing and then click the Add button to the right. Another window will pop open labeled "Add Input Language." Assuming you're from the United States, expand the English (United States) menu, then expand the Keyboard menu, and select United States-Dvorak for left hand. Click OK, and the window will close, and you'll now see the Dvorak keyboard option listed in the keyboard section of Installed Services. Click OK, and you're almost done. With the new keyboard layout loaded, to switch between the two layouts, you'll have to press the CTRL-SHIFT keys. Press CTRL-SHIFT as you walk away, and then watch the prank recipient proceed to screw up everything she types.

Perhaps the best part of this prank is that it's so easily reversed. If your friend asks you to come over and check out the system, sneakily press CTRL-SHIFT again as you sit in front of the system, and everything will work normally. When done right, this is a great prank to make someone feel completely nuts.

## The Dreaded BSOD

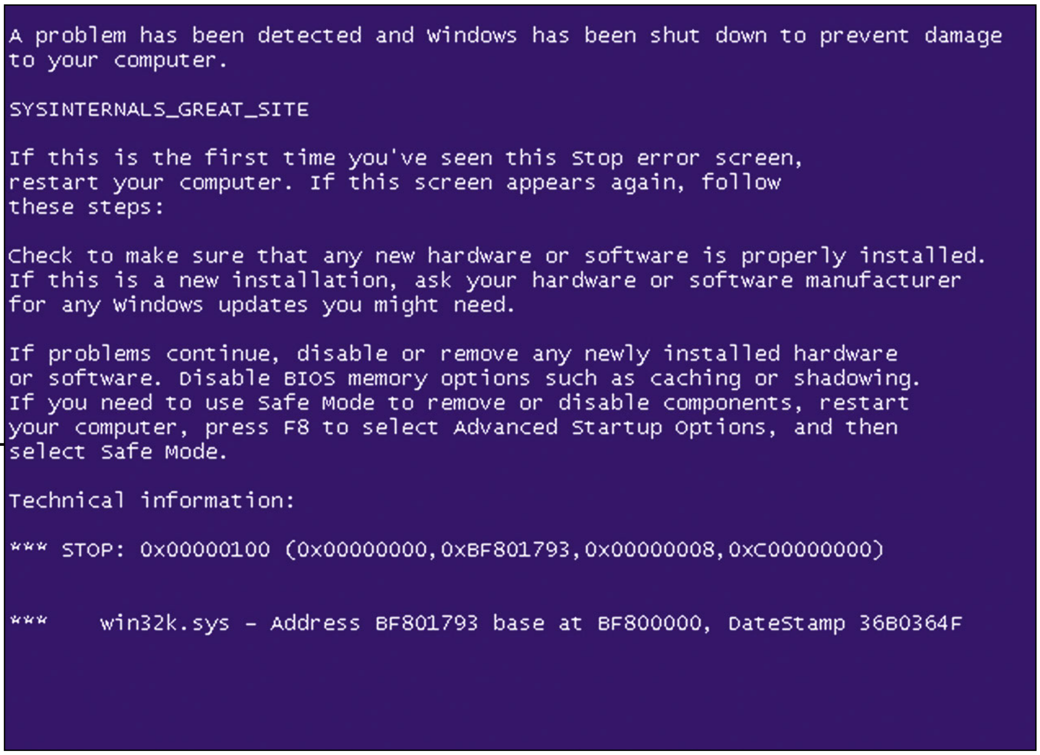
OK. It's time for another visual. You walk away from your system for a few minutes, come back, and are greeted by a lovely Blue Screen of Death. It's happened to most of us power users at one point or another, and it's never a good feeling. But wouldn't it be great to simulate a BSOD and give someone else that sinking feeling?

Surprisingly, Microsoft itself helps out with this little prank. If you hit up MS' TechNet Web site, the BlueScreen Screen Saver 3.2 is available as a free download (tinyurl.com/37msgy). Download the screensaver and place it in the C:\WINDOWS\SYSTEM\ or C:\WINDOWS\SYSTEM32\ folder to install it. Then simply enable the screensaver via the Control Panel. The great thing about the BlueScreen Screen Saver is that it won't exit upon mouse movement. There's even an option to simulate disk activity.

## Take Cover

That's enough goofing around for one issue. We hope our little endeavors here bring you some laughter this April Fool's Day or any day you plan to pull them off. Whatever you do though, please, don't be malicious when pranking your fellow PC buddies. Have some fun, but don't be mean. ▲

**by Marco Chiappetta**



```
A problem has been detected and Windows has been shut down to prevent damage
to your computer.

SYSINTERNALS_GREAT_SITE

If this is the first time you've seen this Stop error screen,
restart your computer. If this screen appears again, follow
these steps:

Check to make sure that any new hardware or software is properly installed.
If this is a new installation, ask your hardware or software manufacturer
for any Windows updates you might need.

If problems continue, disable or remove any newly installed hardware
or software. Disable BIOS memory options such as caching or shadowing.
If you need to use Safe Mode to remove or disable components, restart
your computer, press F8 to select Advanced Startup Options, and then
select Safe Mode.

Technical information:

*** STOP: 0x00000100 (0x00000000,0xBF801793,0x00000008,0xC0000000)


***    win32k.sys - Address BF801793 base at BF800000, DateStamp 36B0364F
```

Few things elicit as much fear and anger in a Windows user as the dreaded BSOD. Want to freak someone out this April Fool's Day? Install Microsoft's Windows Sysinternals BSOD screensaver on their system and wait for the hilarity to ensue.

COOLER MASTER®

THE COOLER MASTER GX SERIES POWER SUPPLIES STAND FOR GAMER XTREME, THE EVOLVED VERSION OF EXTREME POWER PLUS. WITH UP TO 60 AMPS ON A SINGLE RAIL, THERE IS ENOUGH POWER TO START UP A TRUCK, IMAGINE WHAT IT CAN DO FOR YOUR SYSTEM. WITH SO MUCH POWER AT YOUR DISPOSAL, COOLER MASTER ENSURES THE MOST STRINGENT SAFETY STANDARDS ARE MET. THE EXTENDED 5 YEAR WARRANTY IS INCLUDED TO GIVE YOU FURTHER PIECE OF MIND.

NVIDIA SLI READY

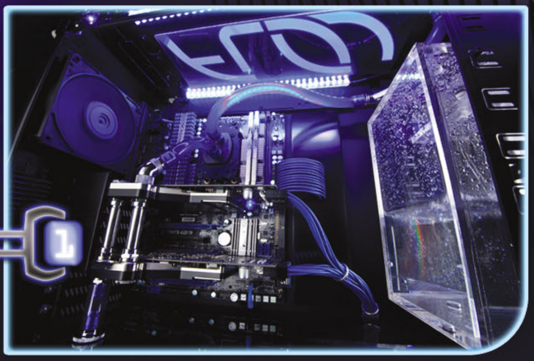
80 PLUS

5 Years Warranty

www.coolermaster-usa.com

amazon.com | buy.com | circuit city .com | the all-new COMPUSA.com | Fry's ELECTRONICS | MICRO CENTER The Ultimate Computer Store | newegg.com | TigerDirect.com

# Mad Reader MOD



1] Flow's interior isn't just clean enough to eat out of; you could perform *surgery* in this thing.

## Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermod@cpumag.com. If we include your system in our "Mad Reader Mod" section, we'll send you a $1,500 Newegg.com gift certificate and a one-year subscription to *CPU*.

# Flow

We ran into Ian "SNiiPE DoGG" Helmar's amazing case mod last August at Intel LAN Fest Nor'Easter in Wilmington, Mass. Flow won the day at that event, and despite some really tough competition from several other very nice mods, it's our pick for top mod from the entire 2009 Intel LAN Fest season.

Flow is based on a Lian Li V2210b, but you'd be hard-pressed to recognize it as such; the silver wheels below and the front door panel are the only remaining distinctive features, and even the front door panel has a dramatically diffferent look thanks to Helmar.

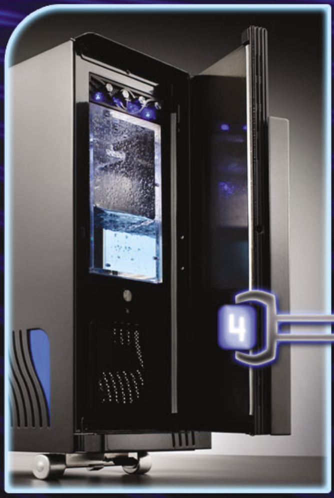
Helmar says his design and the name of the mod were inspired by water (the PC is, of course, water-cooled), thus the use of blue and silver as strong accents against the black, which dominates inside and out. Flow's side panel, front door panel, and top-panel logo are all CNC laser cut, and the case is powder-coated inside and out (satin black and metallic flake black, respectively).

"The front door decorations are meant to be an abstract representation of flowing water and how it intermingles," Helmar says. "I then conceptualized a very large bay reservoir as a main feature to be the real waterfall behind the abstraction that hides it."

Helmar hand-cut the floor of the motherboard compartment out of black granite and built the waterfall reservoir with laser-cut 3/8-inch acrylic. He used these items to create a cooling loop where water started in one place and moved to another as it does in nature, rather than building a standard visible loop.

All of the work that Helmar put into Flow yielded impressive results, but one feature that really sticks out is his impeccable wiring. Helmar didn't like the location of his MSI 790FX-GD70's 8-pin CPU power socket, so he removed it and resoldered it onto the back of the motherboard. This combined with the custom 24-pin wiring plate and harness on the PSU's ATX power connector and the wire harness on the PCI-E power cables give the case's interior a professional look that rivals its remarkably clean, well-designed exterior.

This look didn't happen by accident, though: Helmar says he worked up the entire design using CAD software prior to beginning the construction process, and altogether he has put between 700 and 800 hours into this build. And it shows. ▲



2] How many mods do you know of that are so put together they even have their own logo?

3] Flow is impressive from every angle . . . no detail has been overlooked.

4] Helmar chose specific colors and accents to extend the water theme from the front panel's abstract representation of water to an actual waterfall reservoir just inside.

# advanced Q&A corner

Get informed answers to your advanced technical questions from *CPU*. Send your questions along with a phone and/or fax number, so we can call you if necessary, to q&a@cpumag.com. Please include all pertinent system information.

*Each month we dig deep into the* CPU *mailbag in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable?* CPU*'s "Advanced Q&A Corner" is here for you.*

**Michael F. asked:** I have owned an OCZ Vertex 120GB solid-state drive for a few months now. It had been working perfectly for the whole time, but I was poking around the OCZ forum and saw that they had released a firmware update that supposedly improved performance and implemented TRIM and a new garbage collection algorithm. After doing some reading and seeing all of the positive comments from forum members who had flashed their drives, I decided to give it a shot.

I downloaded the firmware and burned an ISO as instructed, and, after booting to the disc I created from the ISO, the update appeared to have worked properly. But after the fact, I realized I wasn't supposed to flash right to the latest firmware. I'm not sure what firmware was on my drive, but it was stock. I flashed to version 1.5, and now I can't partition the drive in Windows even though it is detected properly, and I can't reflash the firmware for some reason because the OCZ flash utility says the drive can't be identified and is invalid.

Can you help? I don't want to have to RMA this thing and wait weeks and weeks for a replacement.

**A:** Although SSDs are all the rage these days due to their extreme performance, the fact of the matter is they are still relatively immature products that are somewhat prone to problems such as the one that you have described. Over the course of testing SSDs for a recent article, we stumbled across a similar issue with an OCZ Vertex drive and were able to resolve it by placing the drive in engineering mode, flashing to an older firmware, and then incrementally upgrading to the latest version.

Head back to the OCZ support site and download firmware versions 1.1, 1.3, and 1.5 for your drive. Versions 1.3 and 1.5 will be similar in that you can simply burn an ISO to a disc, boot to it, and flash the drive. Version 1.1, however, is a little different. To flash your drive to v1.1, you will have to place it into engineering mode and then run the flash utility from within Windows.

To place your drive in engineering mode, shut the system down and place a jumper over the two pins visible on the back side of the drive, near the SATA and power connectors. With the jumper in place, power up the system, boot into Windows, and wait for the OS to redetect the drive. It will be detected as a Yatapdong Barefoot drive, not an OCZ Vertex Series SSD. When the detection process is complete, run the firmware v1.1

Once the CPU and its cooler are properly installed and the motherboard and drives are mounted properly, the rest of the process is pretty straightforward.

OCZ Technology's popular Vertex Series solid-state drive can be placed in engineering mode by installing a jumper on the two exposed pins on the back of the drive.

executable and follow the on-screen prompts to flash the drive back to the older firmware. When the flash is complete, shut down the system, remove the jumper from the drive, and restart. Windows should once again detect the drive as an OCZ Vertex drive, and the SSD should be working properly again.

At this point, you can then flash the drive with the latest firmware versions. Boot to the firmware v1.3 disc first, flash the drive, and then check that it is still working properly. If it is, boot to the firmware v1.5 disc, flash the drive again, and you should be all set. We should note that this procedure will most likely end up blanking your drive, but because you can't use it anyway, we assume that isn't a problem.

**Darcy G. asked:** I recently bought a new computer for gaming and work purposes. I also replaced my aging surge protector with a new one, just to be safe. However, friends informed me that I "must" get an uninterrupted power supply in addition to the surge protector if I truly wish my new system to be safe. This system has a Core i7-920 processor, Asetek LCLC 240 liquid-cooling system with 240mm radiator and dual fans, Asus P6X58D Premium mainboard, 6GB Corsair Dominator RAM, AMD ATI Radeon HD 5850 PCI-E 1GB, two 500GB hard drives in RAID 0, and a Corsair CMPSU-950TX active PFC PSU.

And that power supply is the problem and the root of my question. Corsair states that it has "active power factor correction (PFC) with PF value of 0.99." I did some research and found that active PFC power supplies seem to require true sine waves from their UPS. There is a great deal of debate about this on the 'Net, however, and it could be possible that a simulated wave UPS would work, but I do not want to lose my system testing that out. True Sine Wave UPS systems are about three to four times the cost of a fake sine wave UPS. My system cost $1,800. I really have a hard time justifying paying a quarter of the cost of my system for a True Sine Wave UPS.

I don't really care if I have two minutes to close the system down in the event of a power outage. I just do not want my system damaged. Can I just use a surge protector? If I do require a UPS, what are your recommendations? Does it have to be the true sine UPS?

**A:** These are all excellent questions, Darcy, and, quite frankly, your questions here had us pause to research our own findings and opinions on the topic in general. First, let's start with your usage model because it's of primary importance in order to answer your questions completely. In a nutshell, you noted that you place a very high value on protecting your system but, in practice, you don't worry so much about losing data in the event of power loss. Also, it's important to note that your system specifications very much read like an enthusiast's laundry list of leading-edge products. So, in short, those are your basic requirements as well as your "risk assessment."

First, we would answer your question as to whether we'd recommend a UPS for your usage model with a resounding "Yes." What many people don't understand is that AC power loss isn't always as simple as the lights going out. In fact, brownouts, where the lights dim or, worse yet, flicker on and off very quickly, are obviously very common. Also, there are many situations where power circuits at your home or office induce fluctuations in current with something as simple as the flip of a light switch. In fact, we had one area of our labs that was seemingly cursed for years with hard drive failures. For a long time, we were puzzled, only to find out that when one of our staff entered the room and turned on the light, the light switch circuit in the wall would induce a current fluctuation that routinely created dips and small surges on our test systems. Even though these machines were plugged into surge-protected power strips, the fluctuation was often enough to kill a hard drive over the course of just a few weeks. So, yes, if you have a high-end desktop system as you do, we'd recommend a UPS if you can afford it. If you're running notebooks or lower-end systems with significantly less current draw, in general, a quality surge protector (with emphasis on "quality") will likely serve you well, so long as data loss isn't a concern.

You obviously are the former case. The relatively high cost of your internal system components, and, in some cases, their sensitivity, certainly merits a quality UPS. What a good UPS is designed to do, other than keep your system running for a few minutes during a power outage, is provide continuous, clean power to your system. This greatly reduces the adverse effects power fluctuations can have on component life. That said, with respect to the requirement of a “true sine wave” UPS, the answer isn’t quite as cut-and-dry.

The short answer is that you don’t really need to spend the extra money on a UPS with “true sine wave” circuitry, though we’d definitely caution against going with a unit that has lesser-quality square wave output. Square sine wave UPSes are built with cheap inverters that produce harsh, square-shaped switching signals that aren’t really sine wave-shaped at all. They can wreak havoc on sensitive equipment. Your particular power supply may be able to tolerate it, but you might hear weird harmonics or buzzing and/or experience damage to system components when the UPS switches to battery mode. Note that you wouldn’t experience any real issue when line current in your home or office is on but only when the system has to switch states from line to battery backup.

There are also modified sine wave UPS designs, otherwise known as pulse-width modified square wave systems, that are just fine for a home PC environment. They cost a lot less to manufacture—much like their square wave counterparts—but produce switching signals that are considerably cleaner than cheap square wave units. Regardless, with UPSes, you generally get what you pay for.

APC’s BR1500 UPS offers four minutes of run time under a full 865-watt load or 14 minutes at half-load (432W). It will also protect your system from harsh power fluctuations much better than a simple surge protector.

We’d suggest going for a reputable manufacturer, such as APC, Tripp-Lite, or CyberPower Systems (www.cyberpowersystems.com). For your use, we’d recommend a UPS in the 1,000 to 1,500VA and 600- to 800-watt range, which should actually allow you about three to five minutes of uptime before the battery is exhausted and your system shuts down.

**Allan V. asked:** A few years ago, my Dad bought me a new Dell computer as I was starting high school. I was never into computers, but after messing around online and playing some games, I got more and more interested in the PC. I have been reading *CPU* for a while now and frequent a ton of hardware Web sites.

Since I’m ready for an upgrade now, I think I want to take a stab at building my own system this time around. I’m confident I have chosen a good list of parts for the build. I’m a member of a few forums, and my friends have told me that the parts I have picked should all work together fine. (It’s going to be a Core i5-based system, with an Evga motherboard, Corsair RAM, and a Radeon HD 5850 in a Cooler Master case.)

I’m good with my hands and don’t think I’ll have a problem piecing things together. But since this will be my first time, I was wondering if you could give me a few pointers and let me know if there are any pitfalls I should look out for when installing each part.

**A:** Congrats on the decision to take the plunge and build your first system. It really isn’t all that difficult, and we suspect you’ll have a hard time ever buying a prebuilt system again.

To answer your question, there are some pitfalls to watch out for. In fact, there are so many different hardware combinations available, each with their own quirks, we could probably write an entire book explaining them. We can, however, give you some guidance that should help with the actual build process.

For the most part, each component is only going to fit in one way. That is to say, you can’t insert a CPU or RAM incorrectly; drive cables only plug in a certain way; graphics cards only fit in certain slots, etc. The easiest part will likely be mounting your drives. Simply slide them into a bay and use your case’s retention mechanism to secure them in place. Just be sure not to place them in bays that may interfere with other components, such as an extra-long graphics card.

Mounting the motherboard can be the single most problematic part of a build. First, you should install the I/O shield. Then, install only as many motherboard standoffs into your case as the motherboard requires. Typically, six to nine standoffs are required. Also, when installing the standoffs, be sure they are in the correct locations for a standard ATX motherboard. Install two or three at a time and then slide the motherboard in place to ensure the standoffs line up with the holes in the motherboard. Repeat the process until you have standoffs for each screw hole on the motherboard. Don’t install more standoffs than necessary, or you could end up shorting out solder points on the underside of the motherboard.

Another area where first-time builders tend to make some mistakes is mounting the CPU cooler. Be sure to install only a small amount of thermal interface material (if it isn’t already factory-installed on your cooler) and take your time to ensure the heatsink sits flush and makes perfect contact with the CPU. If the cooler is even slightly off-kilter, it won’t make good contact with the CPU, and the system could overheat.

Once the CPU and its cooler are properly installed and the motherboard and drives are mounted properly, the rest of the process is pretty straightforward. Plug in your expansion card(s) and data cables, connect the front-panel switches to the motherboard, install the PSU, and connect your power cables. The system should fire up if you’ve done everything right. Our best advice is to simply take your time and don’t rush. ▲

**by Dave Altavilla and Marco Chiappetta,**
**the experts over at HotHardware.com.**

# X-ray Vision: Intel Wireless Display

## Mirror Video Between Your Laptop & HDTV

If you're someone who has discovered the ease with which you can watch streaming HD video from the Internet, including current TV shows, movies, and even YouTube videos, your mind probably already has raced through the possibilities.

Just for starters, no more cable or satellite subscription costs, watching what you want when you want, and no more extensive commercial breaks (your refrigerator may become lonely, but you can live with that problem).

All of that sounds great, but it probably didn't take you long to figure out the problem: Your laptop screen is nice, but leaving your large HDTV screen sitting blank almost seems like a crime. It's much tougher for the entire family to crowd around a laptop screen vs. relaxing on the couch in front of the HDTV. Sure, there are ways to send your laptop images to the TV with a variety of cords, but that's a fairly inelegant solution, especially if you're going to use it on anything approaching a regular basis.

The good news is that it usually doesn't take long for high-tech companies to come up with ways to solve problems just like this. Intel's new Wireless Display technology, which debuted at CES 2010, proposes to take all of the hassle—and cords—out of creating mirror images between your laptop and your HDTV.

### Wireless Display's Introduction

Unlike many new technologies, where leaks and early announcements are common, Intel managed to keep Wireless Display off the radar of high-tech enthusiasts until CES. Between Intel and its partners, Wireless Display products then appeared on store shelves within a couple of weeks of Wireless Display's announcement, something that doesn't happen a lot with new technologies.

"We tried to pad the element of surprise to our marketing efforts," says Intel Wireless Display product manager Kerry Forell.

Intel has been working on the idea of Wireless Display for a couple of years in connection with what Forell calls Intel's "carry small, live large" vision. He says Intel wanted to find a device that consumers could use in their homes to fulfill that vision.

"This concept is part of that vision, of being able to walk into any room with any type of computing device or Internet device . . . and transport the signal to any display," he says.

He says it was important to keep the process as easy as possible, too, and it appears Intel has succeeded. As you can see in the "Intel Wireless Display At Work" graphic, the setup process is almost as easy as connecting the adapter to the HDTV, pressing a dedicated button on the compatible laptop, and watching the video.

"Everything is quickly and easily set up from the notebook side," Forell says. "The ease of use with the hardware button has been a big hit."

### Under The Hood

Intel introduced a technology called My WiFi at CES 2009, and it essentially turns your laptop into its own PAN (personal-area network). Forell says My WiFi is a key component of Wireless Display.

"My WiFi provides this great personal area between the PC and peripheral devices," he says.

The video encoding required to make Wireless Display work requires a large amount of processing power from the CPU. With the announcement of the new Core processors from Intel at CES, Forell says Wireless Display had the chips it needed to become a reality.

"We had the new family of Core processors in our hands nine months ago," Forell says. "It was really surprising to us how well it worked with Wireless Display."

Finally, Wireless Display is using software-based compression and encoding. Between the video capture, encoding, sending, and decoding, it creates a delay of about one-half second between the display on the laptop and the display on the TV. Such a delay in the system makes gaming through Wireless Display problematic, but the delay causes no problems with video.

"The gaming community has required, for realistic interactivity, more on the order of 40 milliseconds . . . as an average," Forell says. "That will take a few generations for us to implement."

Forell says the compression causes no problems, either.

"I think for a time in the industry, there was a question about whether we could do compressed display, and make it look good, or did we need to go to uncompressed?" he says. "Everyone assumed the video would look good [with the compressed display], but it was a surprise with how good the text and graphics look."

### Wireless Display At Retail

New laptops that are compatible with Wireless Display are being bundled and sold with Netgear Push2TV adapters, giving you all of the hardware you need. At this point, you cannot add Wireless Display capability to an existing laptop; you must have a laptop with Wireless Display technologies built into the hardware.

By the way, if you're looking for Wireless Display hardware, do not look for "WiDi," which is an abbreviation some have used to refer to Wireless Display. Intel is not calling the technology WiDi, and you won't see that label on products.

Even with the first version of Wireless Display already on store shelves, Intel is wasting no time preparing for future versions, Forell says.

"We're excited to be doing more systems and improving the feature set," Forell says. "It was a great launch, and we had a great reaction from consumers on the first generation. But, for us, it's just the beginning." ▲

**by Kyle Schurman**

## Netgear Push2TV Adapter Specifications

- Laptop with Intel Wireless Display preinstalled
- 2010 Intel Core processor
- Laptop with Microsoft Windows 7
- Analog or HDTV with HDMI input or AV composite input
- Dimensions: 1.25 x 5.43 x 4.17 (HxWxD)
- Weight: 5.56 pounds

## Intel Wireless Display Specifications

- Requires 2.4GHz connection with wireless router
- HD support
- Full motion frame rate (30fps at 1280 x 800, 1280 x 768, or 1280 x 720 resolutions)
- 128Kbps AAC audio
- Allows up to 20-foot distance between computer and adapter
- Protected output content, such as from DVDs and Blu-ray discs, won't play on Wireless Display

# Intel Wireless Display at Work

The Intel Wireless Display technology is a simple setup, as long as you have a laptop that includes a 2010 Intel Core processor (**1**) and that has Wireless Display preinstalled. Hardware that can use Wireless Display is already on sale, including laptops and receivers that are part of the Blue Label 2.0 program. Netgear is building the adapters, while Dell, Sony, and Toshiba are building compatible laptops.

Setting up the hardware requires placing the Netgear Push2TV adapter (**2**) near the TV, connecting it to the TV with an HDMI cable or AV composite (**3**). To access the proper channel on the TV, you'll need to use a "TV Input" button or "TV/Video" button on your remote control, finding the proper HDMI or AV composite channel (similar to a DVD player or game console).

Each laptop that's part of the Blue Label 2.0 program will have a dedicated Wireless Display button that makes it easy to activate the technology. The button will contain the Wireless Display logo. (**4**) After you press the Wireless Display button, the laptop will automatically connect with the Netgear adapter.

If you haven't made the connection previously, you may have to give Wireless Display access to your firewall. You'll also need to agree to the hardware license.

Wireless Display creates the connection between the computer (called the access point) and the adapter using Intel's My WiFi and the Centrino Wireless technology built into each notebook. My WiFi creates a PAN (personal area network) that lets your laptop find the adapter without officially adding the adapter to your home network. The Wireless Display application will scan the area for a compatible NetGear adapter.

"Everything can be initiated from the notebook," Forell says. "We've reversed the Wi-Fi model, where the access point begins the connection with the station."

Once the adapter is found and displayed on the laptop screen, you select the adapter and click the Connect button. (**5**) At this point, you may have to enter a security code from the TV onto your laptop screen.

After a few seconds, the TV should display a message confirming your connection.

Intel then uses a virtual display driver to capture the display on the notebook, mirroring the display on the TV. (**6**)

The display information is compressed to 720p, 60fps quality. Through the compression, the data goes from about 1 to 3Gbps of information to about 6 to 8Mbps of information.

"We must compress the video to a reasonable speed for transmitting over Wi-Fi," Forell says.

The receiver passes the data to the TV through an HDMI cable or an AV composite output. The system automatically syncs the audio, matching the video. You also can move back and forth between full screen and windowed views: Whatever appears on the laptop screen is mirrored on the HDTV. The type of media player or image viewer you're using on the laptop does not matter, either.

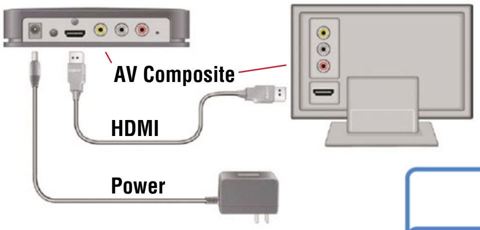
Although HDMI connections are recommended, Forell says video works pretty well over an AV composite output. However, text and graphics aren't displayed as sharply over AV composite as they are on a laptop or through HDMI.

"The adapter is small enough that it could go in a laptop bag," Forell says, allowing you to transport your Wireless Display hardware to a different location away from your HDTV. "You may end up with a TV that doesn't have HDMI, so at least [Wireless Display] can do AV composite."

When you want to stop using Wireless Display, just click the Disconnect button. ▲

1

2

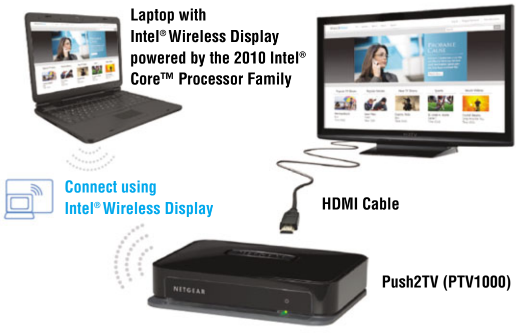


3

4

5

NETGEAR
Connecting to Intel® Wireless Display...
Adapter for Intel® Wireless Display
Laptop
TV


Laptop with Intel® Wireless Display powered by the 2010 Intel® Core™ Processor Family
Connect using Intel® Wireless Display
HDMI Cable
Push2TV (PTV1000)

6

*Source: Intel*

ROCCAT™
SET THE RULES

**Take your competition to the next level with extreme accessories from Roccat!**

*Available in the US only at www.performance-pcs.com*

**SENSE**

- MINIMISED FRICTION
- MICROCRYSTALLINE COATING
- VAST GLIDING AREA: 400x280MM
- ULTRA LOW HEIGHT: 1.35MM
- MAXIMUM GRIP

**SOTA**

- GRANULAR SURFACE
- INTEGRATED METAL FOIL
- HARD'N'FLEXIBLE
- STRIKING SHAPE
- HIGH-QUALITY MATERIALS
- EASY-TO-CLEAN SURFACE

**VALO**

- ILLUMINATED KEYS + DISPLAY
- 2MB MEMORY ONBOARD
- INTEGRATED AUDIO- AND USB-PORT
- 41 MACRO KEYS / MEDIA KEYS
- 5 PROFILES STORABLE, 1 PROFILE-2-GO
- EXTERNAL GAMING MICROPHONE

**KAVE**

- REAL 5.1 SURROUND SOUND
- MICROPHONE WITH MUTE LED
- TIP'N'CONTROL DESKTOP REMOTE
- DUAL SOUND-PROFILE
- ESPECIALLY COMFORTABLE EARCUPS
- ADJUSTABLE VIBRATION UNIT

**APURI**

- ACTIVE USB-HUB INCL. AC ADAPTER
- ZERO-GRAG MOUSE BUNGEE
- DEVICE + CABLE MANAGEMENT
- DIRECT PORT ACCESS
- PASSIVE USE POSSIBLE
- SECURE + STABLE STAND

**KONE**

- PRO-AIM GAMING SENSOR WITH TCU
- INTEGRATED TURBOCORE (72MHZ)
- ONBOARD MEMORY (128KB)
- CUSTOMIZABLE LIGHT SYSTEM
- ULTRA LONG MACRO SUPPORT
- 4 EASY TO CLIP IN WEIGHTS

performance pcs.com

WWW.PERFORMANCE-PCS.COM

SALES@PERFORMANCE-PCS.COM
FOLLOW US ON TWITTER:
PERFORMANCEPCS
321.725.9969

# White Paper: Nvidia Tegra 2

## Second-Generation SoC Aims To Drive Mobile Market

For those who kept an eye on the new products and high-tech announcements from CES earlier this year, one theme stood out: Mobility.

Mobility appeared in many forms at CES, including the ability to manage HD video with handheld devices, use wireless Internet with smartphones and tablets, and transfer Internet streaming video and graphics for display on large HDTVs.

The market for smartphones and tablets should continue to increase, and such devices need strong video and graphics processing capabilities, while remaining power-efficient. With those needs in mind, it's probably no surprise to see a GPU manufacturer providing chips it hopes will drive those mobile devices.

Nvidia's recent announcement of its next-generation Tegra SoC (system on a chip), called Tegra 2, is already making inroads with mobile products. Tegra 2 is an interesting piece of technology that provides the kind of versatility required in the mobile market.

Nvidia's experience and strength in video decoding logic and, obviously, in GPU manufacturing let the company offer strong video playback and graphics capabilities with Tegra. Over the past several years, Nvidia also has focused its research on creating GPUs that conserve power, which is another key component of Tegra's aim at the battery-driven mobile market, where power is always at a premium.

## Tegra 2 Products

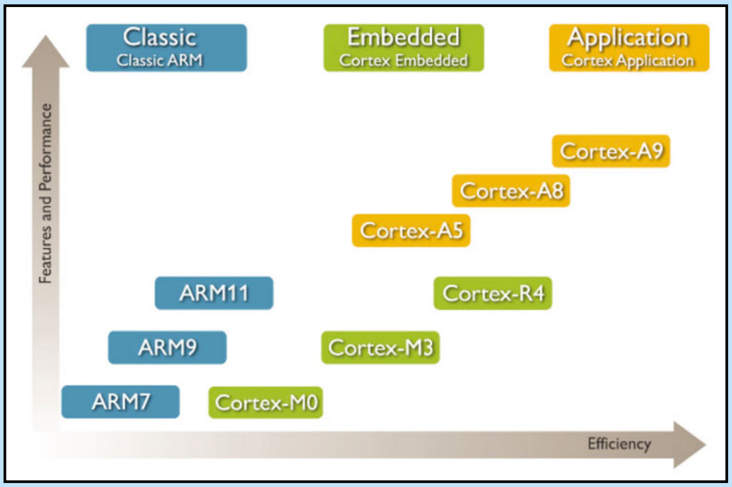
Tegra 2 builds on the original Tegra SoC, which appeared in mid-2008 and now is called Tegra 1. The Tegra 1 chip already appears in the Zune HD media player from Microsoft and the Samsung M1 PMP, and it appears a Tegra chip will power the rumored Microsoft Zune Phone.

However, some problems with processing power have held Tegra 1 back. Bill Henry, director of Tegra product management at Nvidia, says Tegra 2 has fixed those processing problems.

Tegra 2 probably will follow in Tegra 1's footsteps and appear in devices such as smartphones and portable media players. But Tegra 2-powered products won't stop with those types of devices, as evidenced by early Tegra 2 product examples. In late January, Nvidia was demonstrating Android tablets built around Tegra 2, with touchscreens as large as 10 inches.

Nvidia already has Tegra positioned for devices beyond the mobile market, too. There is a product deal in place with Boxee, as Tegra 2 is inside the Boxee Box. (See "The Market For Tegra" for more

## ARM Cortex-A9 Chips In Tegra 2



Tegra 2 makes use of a pair of Cortex-A9 processors from ARM, while the original Tegra used a single ARM11 processor. As you can see from the graphic, the Cortex-A9 chips used in Tegra 2 represent the latest chips from ARM, providing the best efficiency, features, and performance levels in the ARM family of chips. The Cortex-A9 is a significant improvement in performance and power efficiency from the ARM11.

The Cortex-A family of processors uses power-saving architectures while being optimized for Internet usage and video playback. Cortex-A processors appear in netbooks, tablets, smartphones, set-top boxes, Blu-ray players, gaming consoles, routers, and laser jet printers.

The Cortex-A9 can use anywhere from one to four cores. In a single-core configuration, the Cortex-A9 makes use of ARM version 7 architecture and runs at 600 to 1,000MHz. ARM Cortex-A processors have been optimized for Flash 10.1, which is a key feature for Tegra 2.

Nvidia's director of Tegra product management Bill Henry says the decision to use Cortex-A9 in Tegra 2, rather than the Cortex-A8, was an easy one.

"I compare [the A9] to the A8 architecture like the Intel Core 2 compares to the Atom," he says. ▲

*Source: ARM*

# Tegra 2 Architecture

Tegra 2, which contains about 260 million transistors on a 49mm$^2$ die, has eight independent processors on a single silicon chip, highlighted by the two dual-core ARM Cortex-A9 processors. Tegra 1 had a similar architecture, but it included just seven processors, highlighted by a single ARM11 processor. Nvidia's Henry says the ARM11 had some benefits, but there was a serious drawback with Web page loading.

"As we would load a page, a lot of things would happen," says Bill Henry, Nvidia's director of Tegra product management. "It turns out there is a lot of work to be done. The page load was kind of painful. Going double core allows us to have multiple things going on and to get things done. Once they're done, then we can crank down the frequency to preserve battery power."

Tegra 1 supported LP-DDR, but Tegra 2 supports both LP-DDR2 and DDR2.

"We are able to double our bandwidth," he says. "It also helped with cost, as DDR2 is in the sweet spot of the supply chain. The OEMs saw that we could deliver a much better performance in a cost-neutral solution."

The multiprocessor design makes the Tegra a SoC (system on a chip), and the ability to run each processor independently provides two advantages. First, because the processors not in use can be powered down, Nvidia was able to minimize Tegra 2's power consumption. Second, Tegra 2's operations can be performed in parallel, which makes it run efficiently.

"To deliver great battery life, you have to be efficient in everything you do," Henry says. "The processors are specific to their tasks."

The specific tasks include:

**A** The Cortex-A9 chips are the key to Tegra's performance levels when managing the Web browser. The two ARM Cortex-A9 processors run at up to 1GHz and replace the much slower single ARM11 chip. These two A9 processors, which occupy about 10% of the Tegra 2 die, and the ARM7 are the only third-party processors that are part of Tegra 2.

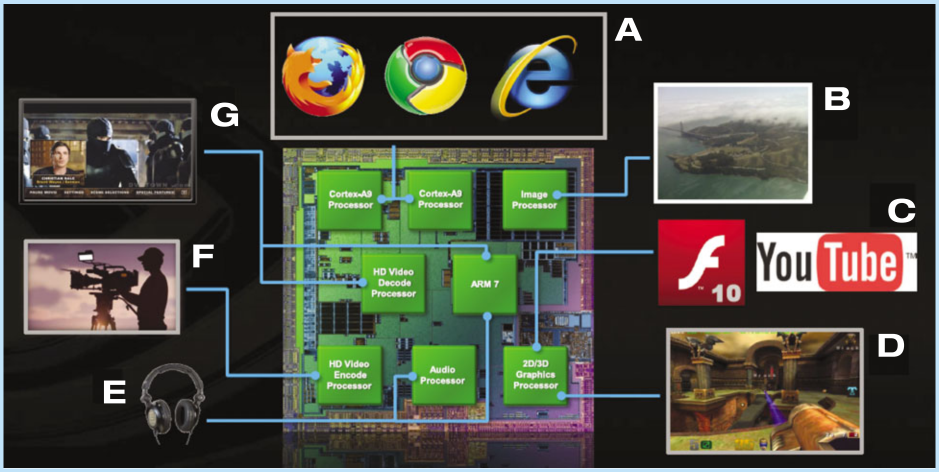
Cortex-A9 makes use of an eight-stage pipeline, which is more power-efficient than the 13-stage pipeline of the Cortex-A8, which is one important reason Nvidia skipped over the A8 and selected the A9 for Tegra 2. With the deeper pipeline, mistakes in branch prediction cause greater power consumption.

**B** The image processor drives still images, and it routes its output to the GPU processor that's part of Tegra 2.

**C** The GeForce GPU processor in Tegra 2 is similar to the GPU used in Tegra 1, but the newer GPU processor has more memory bandwidth and a higher clock rate. With its support for Flash 10.1, Tegra 2 receives the benefit of full Flash video acceleration, which is a key component to delivering strong Web HD video performance, especially when using YouTube.

"If you're going to go on the Web, you're going to run into Web pages that have Flash," Henry says. "We worked closely with Adobe."

**D** During the announcement of Tegra 2 at CES 2010, Epic Games and Nvidia demonstrated the Unreal Engine 3 running on a Tegra 2 SoC.



"We're taking full advantage of the pixel shaders and vertex shaders on the graphics processor," Henry says. "It's a very efficient graphics processor."

**E** The audio decode processor only requires about 10 to 15mW of power while playing an MP3 file. In addition to its audio processing work, the ARM7 processor handles data flow and a variety of chip management responsibilities (including power management).

**F** The video encode processor seeks to accelerate the encoding of 1080p H.264 video. Tegra 1 was only able to encode 720p video, and Henry says Nvidia knew it needed to include 1080p in the next generation of Tegra.

"[1080p] was the minimum where we wanted to set the bar," he says. "More and more people are doing 1080p on their digital cameras; I have one in my bag. I now can upload 1080p to YouTube. When you can encode 1080p, you can start imagining very interesting HD videoconferencing over Tegra."

**G** The video decode processor offers 1080p H.264 video decoding at a bit rate as high as 10Mbps. And with its hardware-accelerated HD multimedia engine, Tegra supports movie playback with low power requirements. ▲

*Source: Nvidia*

information.) Audi will include Tegra 2 chips in some of its vehicles by 2012, using Tegra 2 to power the car's navigational and entertainment systems.

## Tegra's Power Efficiency

Nvidia's past work with power efficiency for GPUs in computing is paying dividends with Tegra's power management, Henry says, as playing 720p HD video through Tegra 2 requires about 200 milliwatts for the processors and 100 milliwatts for the memory.

"It's a far cry from the watts and watts under PC architecture," he says. "Everything has been slimmed down."

In addition, the memory controller with Tegra 2's LP-DDR2 memory is a key component in Tegra's power efficiency model.

"We do a really good job with the memory controller," Henry says. "It's in Nvidia's DNA. It's been core to our battleground for a long time."

Nvidia's engineers focused on power management as they initially designed and built Tegra, Henry says, which has proven important in Tegra's overall power efficiency.

"When Tegra was developed from the ground up," Henry says, "we asked, 'What was the best we could do with 100 milliwatts?' If they needed more than 100 milliwatts, the engineers really had to fight for what they wanted to use the power for."

Many of the strong power management features found in the Tegra architecture come from the use of the individual processors (as shown in the "Tegra 2 Architecture" graphic).

"With separate processors each doing their own tasks, it allows very responsive multitasking," Henry says. "We can turn the engines off when they're not needed . . . to use a minimum amount of power."

Nvidia estimates devices that use Tegra could potentially run 140 hours of music on a single battery charge. Processors not involved in music playback can be powered down to conserve power. In a similar fashion, Nvidia estimates Tegra devices could play up to 16 hours of HD video on a single battery charge by shutting down processors not in use. (Of course, real-world testing will be needed to determine the accuracy of these estimates.)

## Tegra 2 & Tablets

With the first Tegra 2 developer kit board from Nvidia measuring about 5 x 5 inches, it's clear Nvidia expects larger products such as tablets will be a key use initially for Tegra 2.

## Tegra 1 Vs. Tegra 2

The new version of Tegra (called Tegra 2) makes several changes from the original Tegra, which Nvidia announced in June 2008.

Tegra 1 consisted of the Tegra 600 and Tegra 650, and Tegra 1 powered two PMP products, the Microsoft Zune HD and the Samsung M1. Tegra 1 may be included in some upcoming smartphones, as well.

**Tegra 600 (Tegra 1)**

- 65nm manufacturing process
- ARM11 core processor
- 650MHz clock speed
- 720p HD video encode (H.264)
- 720p at 30fps HD video decode (H.264 and VC-1)
- Audio formats supported: AAC, AMR, MP3, and WMA
- 1,280 x 1,024 (SXGA) maximum display resolution
- LP-DDR memory

**Tegra 650 (Tegra 1)**

- 65nm manufacturing process
- ARM11 core processor
- 750MHz clock speed
- 720p HD video encode (H.264)
- 1080p at 24fps HD video decode (H.264 and VC-1)
- Audio formats supported: AAC, AMR, MP3, and WMA
- 1,920 x 1,080 (1080p) maximum display resolution
- LP-DDR memory

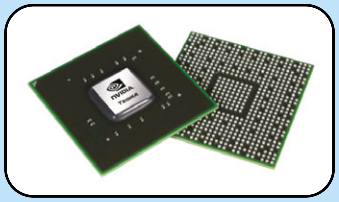
Tegra 1 consists of seven independent processors, one less than Tegra 2. The Tegra 1 processors are: An ARM11 processor, ARM7, HD video encoder, HD video decoder, GPU 2D engine, audio processor, and image processor. The Tegra 2 replaces the ARM11 with two Cortex-A9 processors. Although the other six processors remain of the same general type from Tegra 1 to Tegra 2, the Tegra 2 processors overall have better speed and power efficiency.

Following a timeline similar to its GPU products used in mainstream computing, Nvidia plans to introduce new Tegra models every 12 to 18 months.

"We're bringing to the mobile processor space the kind of development people are used to seeing in the PC space, with new versions every year," Henry says. "What we want to deliver is a great Internet and media experience, with great battery life." ▲

*Source: Nvidia*

**Tegra 250 (Tegra 2)**



- 40nm manufacturing process
- Dual-core ARM Cortex-A9 processor
- 1GHz clock speed
- 1080p HD video encode (H.264, VC-1, and MPEG-4)
- 1080p HD video decode (H.264)
- Audio formats supported: AAC, AMR, MP3, and WMA
- 1,920 x 1,080 (1080p) maximum display resolution
- LP-DDR2 and DDR2 memory

"At CES, there was a massive focus on the tablet form," Henry says. "The reason it came about was several factors coming together. For a long time, tablets were just running Windows, [which] didn't have a UI that was optimized for touch. . . . Now we have Android.

"Everyone thought, 'If you want an Internet experience, you need a keyboard,' he says. "With the Android tablet form factor, now people say, 'All you need is a screen.'" Henry says the size of a tablet screen works well for navigating Web pages on the mobile devices.

"The iPod touch showed that a mobile computer can give you a Web experience," he says, "but the screen was so small. . . . It gets really tiresome to squeeze and scroll the page up and down to see the whole page. We don't need to pan and zoom and squish. The screen must support the typical size of a Web page."

One of the potential drawbacks for Tegra 2 is the system's inability to run common Windows-based applications, because Tegra is not x86-compatible. The Windows OS doesn't run on any ARM-based processor, which may cause some confusion among consumers purchasing a Tegra-powered tablet or netbook.

During its press conference at CES 2010 where Tegra was announced, Nvidia said it wanted Tegra 2 to be the driving force behind the "year of the tablet." Nvidia hopes Tegra 2 can give tablets performance levels close to that of a computer with power conservation levels similar to that of a cell phone.

Although such a proclamation will be difficult to fulfill, with a company that has had the kind of successes in graphics processing that Nvidia has, it might be a mistake to bet against Nvidia in this mobile arena. ▲

**by Kyle Schurman**

## The Market For Tegra

Several announcements of partnerships and products for Nvidia's Tegra 2 occurred in conjunction with the announcement of Tegra 2 at CES 2010, including an announcement that the Boxee Box from D-Link contains the Tegra 2 SoC. Boxee makes it easy to port social networking capabilities and video from the computer to the TV. (Boxee's technologies were profiled in the March 2010 issue of *CPU*. See page 46.)

"[Boxee's developers] just recognize that Tegra serves up a good Internet experience and good HD video," says Bill Henry, director of Tegra product management at Nvidia. "This is what we want to bring to TVs."

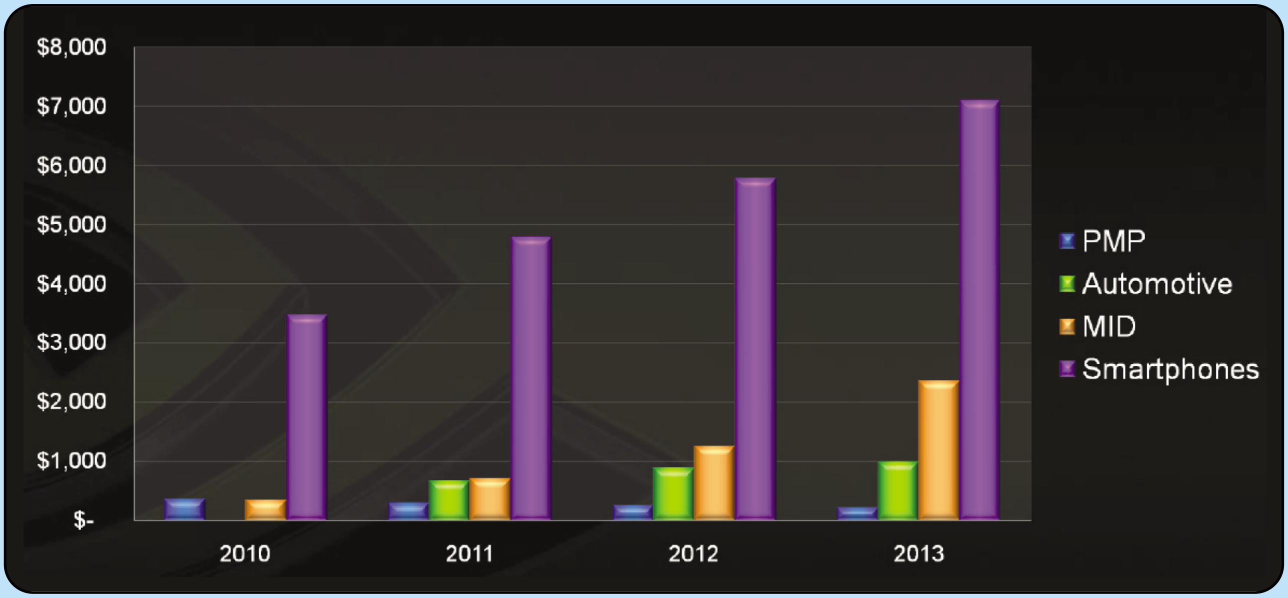
Nvidia expects that the market for products that could make use of Tegra 2—PMPs, automotive navigational and entertainment systems, MIDs (mobile Internet devices), and smartphones—will grow significantly during the next few years. (The amounts the graphic below are in millions of dollars.)

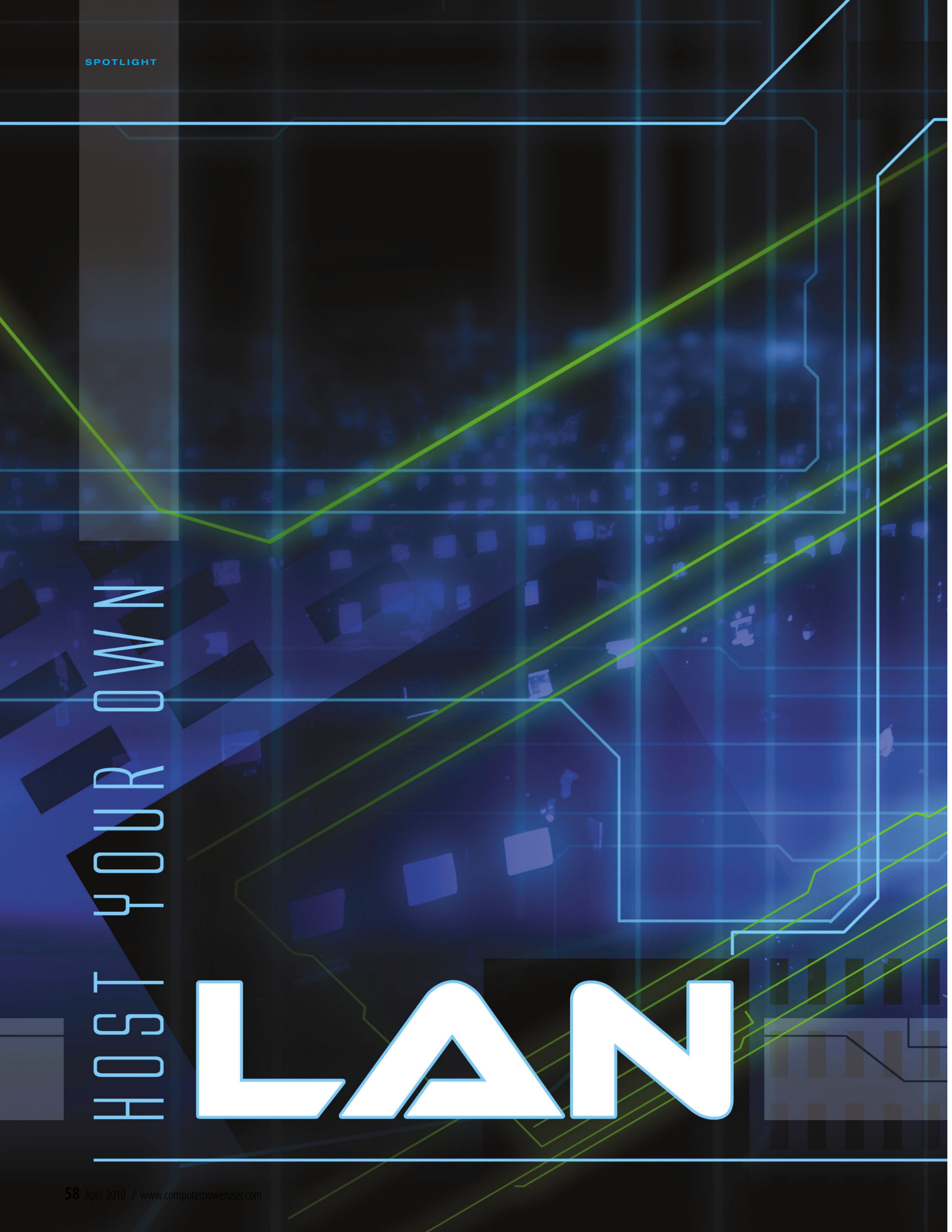
"We have over 50 projects in play right now with our next-generation Tegra," Henry says.

Henry adds Nvidia's current market for mobile products is $600 million to $700 million, with expectations that it will grow quite a bit in the next few years.

"It's been a major focus for us since 2002," Henry says. ▲

*Photo courtesy Boxee; graphic courtesy Nvidia*





# HOST YOUR OWN LAN

# EXPERT TIPS FOR BUILDING YOUR GAME PLAN

60 THE RIGHT STUFF
THE ESSENTIAL LAN CHECKLIST

64 SOME ASSEMBLY REQUIRED
HOW TO STRUCTURE YOUR LAN INFRASTRUCTURE

68 FOLLOW THE MONEY
HOW TO PLAY (& WIN) THE LAN NUMBERS GAME

Ah, how fondly we remember our first LAN party—intrepid warriors loading their *screaming* Pentium II-based rigs into every variety of rusted-out station wagon/hatchback/El Camino, voyaging across vast stretches of asphalt to reach the gracious host's humble dwelling, carefully carrying their beige weapons of choice to the lower-most recesses of said dwelling, and finally bellowing battle cries in nigh-unintelligible tongues before plunging headlong into a Half-Life/StarCraft/Quake II multiplayer melee. We romanticize a little, of course, especially against the backdrop of today's multiday, multithousand-attendee events, but everyone has to start somewhere, right?

In the spirit of starting somewhere, this month we look at starting your own LAN event. To be clear, though, you won't find in the following pages instructions for setting up a QuakeCon-style event. But by the same token, our advice goes beyond which pizza crust style will be most popular among your five friends. Ultra-large and ultra-small LAN parties certainly have their place in the LANdscape of gaming gatherings, but the focus here is on creating an event that requires a venue bigger than your basement but not so big you need to get on the horn with your local arena. If you're interested in kick-starting a 50- to 100-person LAN party and gradually growing it to become a perennial regional favorite, you've come to the right place. (And if you're *not* interested, our answer to the above pizza puzzler is "hand-tossed." You're welcome.)

If you've attended a decent-sized LAN in the past (say, a PDXLAN or a NETWAR, or maybe one of Intel's many LAN Fests), then you might already have a few ideas in mind for your own LAN party. You'll soon find that LAN party planning becomes a game of crossover points. At what point does your basement become too small to hold you and your fellow gamers, and at what point do you need to start looking into a hotel's convention center? At what point will your own 802.11n router become too meager to handle the networking demands of your attendees? And, perhaps most importantly, at what point do you need to start charging an admission fee for your LAN?

In "The Right Stuff," we give you general pointers for tackling the most pressing concerns—finding a venue, determining how much power you need to run all those PCs (this is more crucial than you might think, at least according to one seasoned LAN organizer), paying the bill, establishing law and order, and planning for the future. Running a LAN party requires a lot more than circulating an email with a meeting place and time, as you'll soon find out.

As your LAN grows (actually, probably *before* it grows), having the appropriate infrastructure in place becomes proportionately more important. However, you might think that as soon as you move into the family room of your local Perkins that you need to start "borrowing" your employer's networking hardware. You'd be wrong: Consumer-grade hardware and broadband service can often comfortably manage LANs as large as 50 attendees. "Some Assembly Required" drills down to the finer details of calculating bandwidth and power requirements, setting up and routing the network connections, and testing a facility's capability to host your event.

And then there's that persnickety little thing called money. You need it, probably lots of it, and *definitely* lots of it if you have to rent a venue. We can tell you right now that taking out a second mortgage is not the best way to pay for your LAN; "Follow The Money" will help you estimate and anticipate the final bill so your LAN party doesn't become a loan party. You'll also find that sponsors are more approachable than you might think, provided your event can live up to their expectations.

Through it all, though, remember that a LAN party should still be a party. Though LAN parties won't always be fun to plan, you should always plan for fun. ▲

**by Vince Cogley**

# THE RIGHT STUFF

How many buddies can you cram into your garage? Six? Twelve? At what point do you outgrow a basement? For many gamers, there comes a day when you want more—more people, more fun, more vibe. You want to put on a *real* LAN party, just like those events you've either heard about or personally attended. Why settle for 12 people when you could host 120? But a lot of details need to be addressed when you migrate a LAN out of the basement, beginning with the most important.

## Venue

Where will you hold your event? Think about places where people gather. How about fraternal orders, such as the Eagles or Elks? How about churches? Depending on the organization, there may be codes of conduct more strict than those of even a well-run, respectable LAN party, particularly in regard to language used in the heat of battle, so be honest with potential hosts about their expectations.

Another common venue is local schools, especially the cafeteria or gymnasium. Pay special attention to the floors here, though. School officials don't want to arrive on Monday morning and scrape leftover adhesive off their gym floor or find a patchwork of duct tape scraps littering the cafeteria.

This typical scene, from PDXLAN 14, shows the look and feel of a 500-seat event in a hotel conference facility. Note the somewhat close spacing of the table rows, which organizer Matt Conwell says helps foster a more personal, fun atmosphere.

Alternatively, especially given today's commercial real estate market, you might also find available space to rent. The trouble with commercial spaces is that it can be leased to a new business at any time.

"The problem with most venues is that they'll have the space but not the power," says Matt "Vector" Conwell, owner of PDXLAN (www.pdxlan.net) and organizer of a wide variety of LAN events around the country, "or they'll have the power but not the space. Your goal to find a proper venue is a place that has both."

Assuming your event will last more than a few hours, you'll need to consider food. Some venues will have an adjacent cafeteria, which can be either a good or a bad thing depending on your attendees' expectations. Often, you'll want a venue with nearby restaurants of the pizza/burgers/sandwiches bent. Some shops that don't normally deliver will make an exception if the attendance looks promising enough. If you give nearby restaurants advance notice, they might even extend their evening hours.

"Do you want to supply food for free and have the cost included in sign-up?" asks Tori Pugliese, marketing manager at gaming hardware vendor SteelSeries (www.steelseries.com). "Or is it easier to bring in local restaurants or caterers selling snacks as fundraisers like candy bars, chips, etc.? Chain restaurants that are associated with sponsoring high school sports would also be excellent to approach."

Of course, food and drink lead to another inevitable concern. When planning an event of any size, keep an eye on your ratio of people to restrooms. A 1:100 ratio isn't pleasant. Also, don't assume that public restrooms and/or nearby restaurant restrooms will be available for all of your attendees unless you have explicit permission.

If you're planning on a relatively low headcount, as in less than 40 people, consider using the banquet/meeting room in a restaurant. Conwell recounts one event he attended that was held at a local Denny's. A total of 25 tickets at $20 per person were sold, and the admission price included dinner. That's a pretty sweet deal for everyone involved, especially if there's direct access to the banquet room from the parking lot.

# THE ESSENTIAL LAN CHECKLIST

For larger LANs that run over multiple days, hotels are a perennial favorite venue, especially because a hotel will likely work with you on the price of its conference room in return for a commitment on rooms booked. Be careful here, though.

"If you commit to too many rooms, you could be on the line for them if they don't sell," says Conwell. "If you promise 100 rooms at $100 each and you only fill 80, that's $2,000 out of your pocket. It adds up quick. Don't get into a deal you can't handle. Undercommit and over-deliver."

## Power

We dig further into power concerns in "Some Assembly Required," but for now, we want to cover a few essentials that are inherently tied to venue selection. You'll likely find that many venues, especially smaller ones, fail to adequately understand their power setup. A manager might look at a room with five outlets, each offering two plugs, and tell you that he has 10 circuits. He probably doesn't.

The only way to be sure that you have adequate power for your attendees is to use lamp testing to create a power map. This means that you take a map of your LAN event's environment and mark every outlet on the map. Then you take a lamp and, one by one, plug it into every single outlet on the map. Once the lamp is lit, go to the circuit breaker box and identify exactly which breaker turns off the lamp. In this way, you can gain a precise knowledge of how many circuits there are and where they run. Be sure to clear this with the venue's management before beginning this undertaking, however.

You'll also need to find out how many amps are on each circuit, keeping in mind that you don't want to sustain more than 80% load on a circuit. As a rule of thumb, Conwell figures 20 amps for every six people. John Motter, who is an organizer of Intel's LAN Fest Portland, says that he estimates 3A per person.

Motter says, "If you need more power, you go with a generator. I've never used a generator at a LAN, although I've been to some that have. I just don't want the hassle of bringing it onsite and having to get the hazardous materials—the diesel fuel—approved. I just don't think [a LAN organizer] needs that complexity."

Conwell describes renting power as "pouring money down a drain."

## Marketing

Introverts will find this aspect of running a LAN to be the hardest of all. If you want to grow your event beyond your circle of friends, it will require getting in front of strangers and persuading them to attend your party. Having charisma will help. If you're not charismatic and good with strangers, hopefully one of your buddies is.

Where do you find these strangers? The most obvious and effective place is at existing LAN parties. Some admins are willing to help promote other local LAN parties, believing that fostering enthusiasm in the LAN community helps everyone and increases the overall audience. If the LAN's admin provides a corner or bulletin board for other admins to advertise, use it. If you can get them to introduce you personally to their group, that's even better.

Word of mouth is far and away the most effective means of promoting your LAN. If you're already running a small LAN (or are a recognized regular at another LAN), ask the attendees to find and sign up one guest to your planned, larger event. If you frequent local PC hardware shops or game stores enough to know the employees, ask them to attend and refer you to others who might be interested. Colleges tend to be pretty fertile recruitment grounds, as well. Just be warned that putting a flier up on a bulletin board tends to yield few results. The human touch is far more effective—so effective that Conwell states he's never spent a dime on advertising PDXLAN, which is now the largest regular LAN on the West Coast.

"Another way to get the word out for your local LAN party includes social media," says SteelSeries' Pugliese, "the free and easy way to tell the world about what's going on. Use Facebook, Twitter, forums, and even blogs. There are also sites like www.lanpartylist.com,

Heavy construction can mean heavy power requirements. LAN party systems tend to pile on as much bling as speed, and that can mean even more demanding power needs. If your clientele leans toward monster boxes, consider increasing your per-capita amperage figures.

Got grub? Pizza is the perennial staple of LAN parties, but you'll want to coordinate with nearby pizza shops to make sure they're ready for the spike in demand. You might work with them to extend hours and offer discounts to event participants.

www.gamerzunite.com, www.lanpartymap.com, and GotFrag.com."

And, of course, go to www.computerpoweruser.com/lanyard to take advantage of our LAN party resources.

## The Money

Venue may be the most important aspect of LAN party planning, but many people immediately jump on the idea of sponsorships. Some naively assume that because their vision for the LAN-to-be is so compelling that sponsors will fall all over themselves to cough up CPUs, video cards, and all manner of other big-ticket prizes.

In the real world, sponsorship is a commercial decision made by companies fighting tooth and nail to maximize profits for their investors and shareholders. If you don't sell the idea of sponsoring your party as a sound business decision likely to yield an acceptable return on their investment, your odds of success with vendors will plummet.

"SteelSeries is approached daily about providing products and/or support for LAN parties," says Pugliese. "Most requests that come in are parties ranging from 50 to 100 attendees, but the bigger the better." Pugliese says that SteelSeries almost always sponsors LANs guaranteeing at least 100 attendees. "Things that 'wow' our team include an excellent Web site already designed, examples of where the sponsor logos will go, and talking about where the event will be cross-promoted with other partners. Will you do a local press push, etc.?"

For an idea of what vendors will expect to see in the *first round* of questioning, see SteelSeries' site at tinyurl.com/ykb9afj.

Conwell and Motter both agree that beginning admins should approach vendors looking for swag—lots of swag—such as T-shirts, caps, banners, posters, pens, key chain fobs, mugs, USB flash drives, etc. For vendors, this is cheap advertising for their target audience, and it ensures that every recipient leaves with that advertising in hand. Conversely, a single prize, such as a CPU, only vanishes into one person's bag. Swag is fun, and most people like winning it.

If this sounds like sour grapes, look on the bright side: Do you want attendees who are motivated by big prizes or those motivated by big fun? Attendees only after big-ticket prizes often have bigger attitudes and cause more problems. Because of this, many LANs don't announce their prizes until after registration closes, just to make sure that the people who show are there for the "right" reasons.

Speaking of registration, how much should you charge? At least in the beginning, just look to break even. If you make a little extra, consider it gravy, or do as Intel does with its LAN Fest proceeds and donate it. (So far, Intel LAN Fest has given over $300,000 to charity.) Regardless, you may want to avoid taking a loss by padding your admission prices by a given percentage. Attendee dropouts are your biggest concern. If you arrive at a per-person cost of $50 and pad the admission price by 20% to $60, you now have a buffer in case 20% of your registrants fail to show up. The second and simpler method is to have a no-refund policy. Some attendees might object to this, but these are the best ways to avert potential financial disaster for yourself.

## The People Factor

Remember that 25-seat LAN party at Denny's? According to Conwell, it had a good run with regular attendees, but eventually it died. The event petered out not because of Denny's but because of the admin, who never did anything to make the party different or more interesting over time. It was the same meeting, over and over.

"I always hate it when people tell me that PDXLAN was the same thing as the year before, because that means we're getting stale and we'll cease to exist," says Conwell. "That's why we really change things up with contests. We did shuffleboard contests with old hard drives. Rather than do another eating contest with the LAN staple of pizza, we changed to Costco muffins, and it was a hoot. Wii Tennis. Rock Band. Dodgeball in the parking lot. Just doing fun and crazy things we don't normally do. At our last event, we did Family Feud. It was amazing!"

Ironically, though, the Family Feud got taken a bit too literally. In the absence of a buzzer, players had to grab a baton on the table before them. In one of the final rounds, two contestants had a death grip on the baton. The larger male contestant decided to resolve the issue by judo-flipping the 125-pound female contestant. Yes, for real.

This is why codes of conduct and making sure you attract the right audience are essential at LAN parties. Understand that when you rent a property, that property is legally yours to control during the rental period, with all of the rights and liabilities thereby associated. For personal conduct, it might be prudent to either have a lawyer draft you a waiver form or else "borrow" one from a large, well-established LAN in your area.

PDXLAN uses a waiver containing a list of 35 rules to which each attendee must agree, with the last of these being "Admins are always right and have the final word in all decisions." If people get out of line, you can call the cops and have them removed. And just remember that if you make rules, you need to uphold all of them without exception. If you let one attendee use speakers, they all will think they can use speakers, and with one rule broken, people will think all rules can be broken.

For individual game rules, you might consult the World Cyber Games past and present lists (tinyurl.com/yhk29hj), but Motter cautions setting up tournaments with certain games.

"Try not to run your tournaments for the games that the professionals are playing," he says. "It might be a great game, but you probably won't see it at too many LAN parties because it brings the group of people that play *that game*. If you get a pro or semi-pro group that effortlessly destroys everyone else, it can ruin the event."

## Growth

PDXLAN went from 20 people to 500 in one year, but Conwell says this was a fluke and has never seen it repeated. Instead, a far more prudent course would be to aim for growing 50 to 100% each year. Go from 20 to 35 or 40. Go from 35 to 50, and then from 50 to 75 or 100. Work your way up gradually and make the inevitable mistakes that come from learning the ropes on a smaller scale. Again, Conwell cites the disaster that was the Portland Expo Center.

"They charged me over $12,000 for power—*just* power. My wife and I were sick the week before, because we were in the hole about $10,000 up to a week before the LAN. We had 800 attendees. That's $15 per person just for power. On top of that, the venue cost $8,000 per day. Now we're at $45 per person. At that time, we were offering soda for everyone, so that's another $7 per person. And the Expo Center charges $2 per chair rental, $30 for a two-person table.

"It really adds up quick at these bigger venues. The power is so expensive because of the union required to lay out the power. The Expo Center is a union shop. It was like $120 per 20-amp circuit just to be laid on the floor and plugged in. That's why venue selection will make or break you."

Ultimately, Conwell decided that an event of more than 500 people would be unsustainable given the kind of audience and event he wanted to maintain. Psychology is important. For example, the Expo Center venue doubled aisle widths to 12 feet, which made the event far less personal for participants. With so much distance, you might as well be playing online. On the other hand, too much closeness can violate venue codes and possibly city ordinances.

Talk with your venue manager about codes. Beyond a certain point, the local fire marshal may need to be involved and approve your floor diagram and power map. You don't want the fire marshal to appear on your doorstep 60 minutes before your LAN is scheduled to start and order you to redo your entire wiring and table layout. It happens. This is why it's important to work with the venue manager as early and thoroughly as possible, because the manager will often go to bat for you with city officials if you've done your homework properly.

With each step in your LAN's growth, expect to make mistakes. Just make sure you learn from your mistakes and avoid repeating them. Do this and you won't have attendees for long. So go slowly, do your planning many months in advance, and keep your growing LAN as safe as it is fun. Game on! ▲

**by William Van Winkle**

## Top Tips From PDX

We've covered a lot of "big picture" factors in organizing a LAN event, but what about the stuff to keep in mind as zero-hour approaches and your party is actually under way? We asked PDXLAN's Matt "Vector" Conwell for some more advice.

1. Have a clear plan of attack for the event. How is your setup going to look? What needs to be done and when? If it's not done before the doors open, things are only going to get worse.
2. Make sure your power is good to go before the doors open and keep an eye on power throughout the event. It's the single most important thing in the room.
3. Have a contingency plan if something goes wrong.
4. Say hello to everybody as you rush by. You don't realize it, but often people are there to see you as much as they're there for the LAN. It can take a lot of nerve for people to walk up and introduce themselves to the LAN organizer. Be friendly so they don't have to.
5. Make sure everyone knows the schedule, including sponsors and staff. The schedule is the plan that's public. The "plan" involves the internal schedule but also includes stuff that isn't on the schedule, like monitoring traffic.
6. Keep your staff fed and rested. If they're not happy, they're not going to react well to attendees, and your event is going to get a bad name.
7. Watch the physical temperature of the LAN. Places will tell you they can maintain 70 degrees with no problem—when there are 20 people in the room. How about with 200 computers?
8. Extrapolate requests. When someone asks me if they can bring in an extra monitor, I immediately multiply that request by assuming that every attendee will want the same thing. What will an extra 200 or 500 monitors do to the space and power configuration? I answer based on the multiplication, not the individual. ▲

# SOME ASSEMBLY REQUIRED

There's really only one good cure to that lonely, solitary feeling you can get playing the same online game at home, alone, night after night—and we're not talking about stopping the game and getting some sunshine and fresh air. (Geesh, thanks Mom.) No, we're talking about getting together with other people, in real life, with our computers and gaming gear in tow, and having a good ol' fashioned LAN party.

A LAN party is in many ways like a normal party, complete with social interaction, food and drink, stories, and laughs—just the thing to make you feel like a part of society and civilization. But there's also a LAN present, suitable for use with online games so you can all try to kill each other (virtually, of course, and in the spirit of fun).

We expect you to already know how to have a party. You might not be on top of what it takes to build the LAN part of the LAN party of your dreams. So, we've consulted a few LAN party veterans, along with our notes from when we've run LAN parties and gaming conventions, with the intent of helping you figure out what it takes on the technology side of things to put together a successful LAN party, be it for just a few friends or maybe for a few hundred.

Basically, the tech boils down to having enough electricity, a functional LAN, and in almost every circumstance, a broadband Internet connection. But the devil is in the details.

## Broadband Bandwidth

When you plan a LAN at a permanent installation, you build for the long haul. The LANs at LAN parties, however, are almost always temporary, being set up before the party and torn down as soon as it's over, so planning one is a little different. It needs to be good enough for the number of attendees, supplying just enough bandwidth to accommodate everyone's gaming, but it has to be reliable immediately and not require a lot of tinkering to keep running. Even an hour of downtime is a significant portion of a short LAN party. So, planning is important.

Unless you're all playing on a game server located within your LAN party (more on this a little later), everyone will be connecting to a host on the Internet, so doing some bandwidth math is the first step. Calculating bandwidth needs is surprisingly simple: Take the number of players and multiply it by the bandwidth a game needs to its server, adding about 20% for some overhead. You might be able to get away with less overhead for cooperative players who are good friends, but plan on more overhead for players you don't know very well.

Determining the bandwidth a game uses to talk to its host is simple, too. Download and install the free program NetStat Live from AnalogX (www.analogx.com) and let it run while playing the game, though there are other free bandwidth meters you can use. Periodically ALT-TAB to NetStat Live and observe its Incoming and Outgoing connection graphs. Look at averages and don't worry too much about the irregular peaks. Another method is to play through a router that displays bandwidth utilization graphs, but be sure only one computer is playing through the router for an accurate measurement.

If you think folks will be playing different games, try this with all the games, find the game that needs the most bandwidth, and use that for your calculations. You'll probably be surprised how little bandwidth modern games need. Under 50Kbps on the

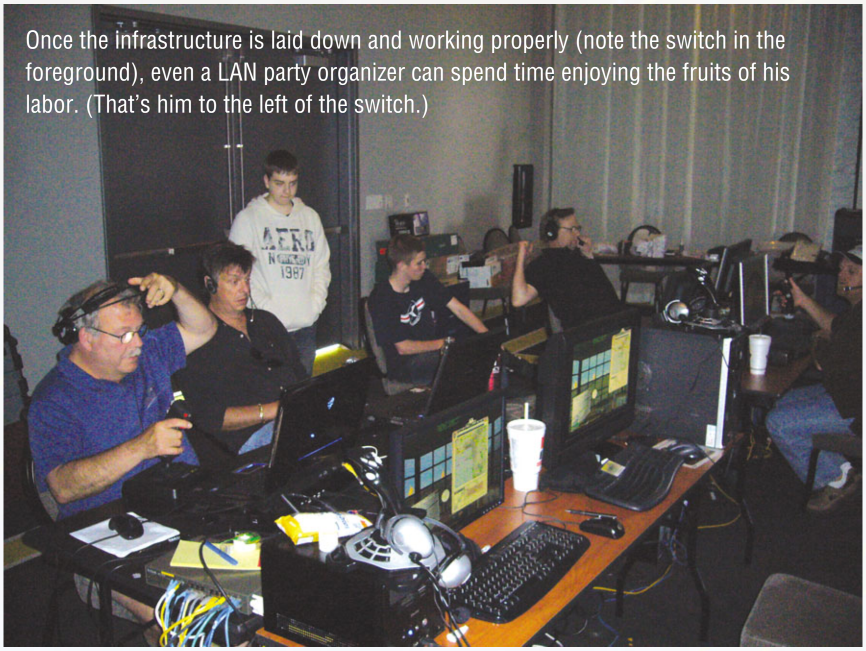
For smaller affairs of fewer than 50 people, you might be able to get by with a standard consumer-grade networking hardware. However, as your LAN grows in size, you'll probably need gear that can handle some heavy lifting, such as this Trendnet switch.

# HOW TO STRUCTURE YOUR LAN INFRASTRUCTURE

download side is pretty common; some games require less than 10Kbps. The upload sides are usually only a quarter as large as the downloads. As an example, you can have 22 players playing a 50Kbps (download side) game and still have 20% extra capacity on a 1.5Mbps connection for a given direction.

"For the last Aces High annual convention, we've had about 50 PCs connecting to the game server through the hotel's [wired broadband connection], and we were just fine, even with other hotel guests using the connection," says Roy "Skuzzy" Neese, network administrator and community manager for HiTech Creations (www.hitechcreations.com), publisher of the World War II combat flight sim Aces High.

Similarly, the NETWAR Omaha LAN party (www.netwar.org) usually has about 200 computers online at any time, with their Internet connection split among three basic cable modem connections supplied by Cox Communications, Travis Kreikemeier, NETWAR'S Internet coordinator, tells us. To be fair, most of NETWAR's game servers are located onsite for the event, "but users still need to download patches and games, check mail, and surf the Web," Kreikemeier says. "We do some basic traffic shaping and P2P blocking with the router so the connection is fairly divided, but bandwidth is rarely the problem.


Once the infrastructure is laid down and working properly (note the switch in the foreground), even a LAN party organizer can spend time enjoying the fruits of his labor. (That's him to the left of the switch.)

As another example, we've wired up 80-seat gaming conventions in hotel ballrooms with a single synchronous 1.5Mbps T1 line without bandwidth problems, even without advanced routing rules. (Though, to be fair, this was in an era before widespread P2P.)

So in some ways, adequate bandwidth might be the least of your problems.

## Get Connected: Building The LAN

The LAN consists of two parts: the physical infrastructure (including cables, switches, and routers), and the logical infrastructure (the DHCP server and other router/networking settings). If your venue has one or both infrastructure types available, there are advantages and disadvantages to using them vs. doing it all yourself with your equipment, so these need to be weighed. Let's talk about doing it all yourself first.

The basic LAN consists of at least one router connected to the broadband connection, enough switched Ethernet ports for all of the computers that will be playing, and enough Ethernet cables to connect everything.

"Make sure everything is running on a switched network," advises Neese. "Nonswitching hubs are really, really bad here." The problem has to do with network congestion. Hubs are "dumb" devices that immediately rebroadcast packets received on one port directly to all the other ports, meaning that computers need to wait for a clear period before transmitting packets of their own. A switch (or "switching hub" or "switched hub") is a "smart hub." It actively looks at each packet, determines its final destination, and then routes the packet directly to the only Ethernet which will eventually lead to the packet's end point. It verifies packet integrity, inspects traffic quality, and essentially acts like a "packet traffic cop" so data passes through intersections smoothly.

"A smooth gaming experience is all about the smooth delivery of packets. It's actually more important than raw bandwidth," says Neese.

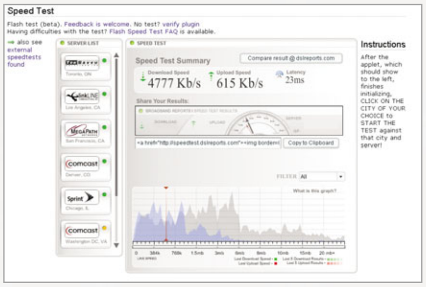
So start building the LAN by getting enough switches with enough ports to accommodate all the PCs that will be at the party. If you'll be supplying all the necessary cabling, you can use a single, large, centrally located switch and use lots of very long cables to reach everyone. If players are bringing their own cables, experience shows that hardly anyone brings cables much longer than 15 feet (well, we do, of course), so instead plan on having smaller switches distributed throughout the venue, with each of the switches connected to each other. The intelligent packet inspection will work through multiple switches.

Once computers are physically connected, they need to talk to each other via TCP/IP, which means each machine needs its own IP address. Although it's possible to manually assign static IP addresses to each player's computer, this becomes a big headache as you encounter players who don't know how to change their TCP/IP settings. Still, if for various technical reasons you must work this way, handing out slips of paper with IP address assignments (and don't forget addresses for the gateway, netmask, and DNS servers) is the way to go. Write basic instructions for how to manually change addresses on a blackboard or overhead projector, or just instruct those who know how to do this to help those who don't.

Of course, it's much easier to have a DHCP server (usually a router with a built-in DHCP server) assigning IP addresses, but be sure to check the size of the DHCP assignment pool. Many routers have an off-the-shelf setting of only 50 IP addresses, which is obviously a problem if you have more than 50 computers hooking up. Increasing the size of the pool to at least 100 or 150 addresses is a good idea, as the overhead can account for machines and devices that get an IP and then disconnect from the network unexpectedly.

Should you bother with providing 802.11 wireless access? Opinions range from "possibly" to flat out "no." Jed Penna, one of the organizers of Intel's LAN Fest (lanfest.intel.com), plainly says, "We don't even run [wireless]; we don't even see a reason to provide it. Most of the PCs are desktops anyway, so they all have [Ethernet] ports. Plus, latency during competition can be a really upsetting issue."

Roy Neese says that wireless "can work for small numbers of players," but that the resulting connection is a lot more variable than a wired connection. As such, if your router is a wireless model, and within range of the gamers, it may make a good backup connection for the hypothetical one or two players with laptops whose Ethernet jacks aren't working. Otherwise, turning it off means one less thing for you to worry about.



Speed Test

Flash test (beta). Feedback is welcome. No test? verify plugin
Having difficulties with the test? Flash Speed Test FAQ is available.

also see external speedtests found

Download Speed 4777 Kb/s
Upload Speed 615 Kb/s
Latency 23ms

Instructions

After the applet, which should show to the left, finishes initializing, CLICK ON THE CITY OF YOUR CHOICE to START THE TEST against that city and server!

DSL Reports' speed test is one of the many free tests you can use to determine if a potential venue has the bandwidth to handle your LAN.

## Route The Connection

The router acts as the gateway between all the players on the LAN and the Internet at large, and being the brains of the LAN, it performs several tasks. On a basic level, it acts like a smart splitter, slicing up the broadband connection so that each PC on the LAN can talk on the Internet. It usually also assigns IP addresses to the LAN via its own DHCP server, and must also act as a firewall, blocking undesired inbound connections while opening up ports for outbound connections as necessary. (Incidentally, there was a time when you needed to manually open ports in a firewall for specific games, but almost all modern games can now gracefully navigate through a firewall.) Hooking up the router in a LAN party is just like doing it at home: Plug the broadband connection's cable into the router's WAN or Internet port and then plug your switches into any available LAN port.

The quality and robustness of the router you need basically depends on two things: how many players you have at your LAN and whether these players are "good LAN party citizens."

"A 'dumb router' can handle 10 or 20 people pretty well," says Neese. And by "dumb router," Neese means an off-the-shelf, consumer-grade router with factory firmware. And in fact, we'll admit to using an ancient Linksys BEFSR81 wired router to share a T1 connection among 80 PCs in hotel ballrooms in 2001 and 2002.

But today, realistically, when you start reaching 40 or 50 people, then you start needing more advanced routers with special features. Penna agrees, saying "50 people is probably an upper limit where special equipment isn't needed. People downloading videos and running P2P software can be a problem for others." Straightforward video downloads can saturate the broadband connection, and P2P connections can saturate the router's internal routing tables and generate inconsistent packet routing. If your group can be trusted to not use the LAN party's connection for these things, then a dumb router may suffice, but some LAN partygoers feel their registration fee entitles them to do whatever they want on the Internet, so then you need a smarter router.

"Without traffic shaping, games would suffer," Penna tells us. For LAN Fest, traffic shapers ensure that gaming-related packets receive the highest priority through the router and subsequently the LAN itself, while other LANs are able to get away with using the QoS (Quality of Service) settings available on higher-end routers or even prosumer-grade routers running DD-WRT (www.dd-wrt.com) or other advanced open-source firmware. For best results, you need to figure out what ports your games are using and give those QoS priority. Then, optionally, reduce priority for nonessential traffic, block certain protocols entirely, and block obvious bandwidth-sucking sites such as YouTube.

## The Server Situation

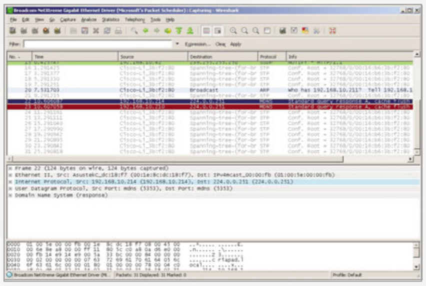
The mechanics of a dedicated server at a LAN party are very straightforward and involve doing two things. First, to make the game server easily discoverable on the LAN, give the game server computer a static IP address and then just post the IP address on a chalkboard, whiteboard, overhead projector, or even just scraps of paper handed around the room. Then, when players' PCs prompt them for a server address, just input the IP address (and, if necessary, the port number) on display.

The router's firewall determines if the server will be visible and available to the outside world. If you want to keep the LAN party's game server private, just make sure the router isn't set to allow communications over the ports the server needs to communicate with the outside world. On the other hand, if you have some folks who couldn't attend the party but still want to get in on the fun from home, open up the necessary ports. If you do this, be sure there's an administrator on hand who knows about the "kick" command, letting you dismiss uninvited players. You can normally learn which ports need to be opened or closed on the discussion forums dedicated to your game.

## Use What's There

In 2010, a lot of potential venues already have not only broadband access but also a ready-to-use LAN and wireless network. Should you use it? Possibly. Before signing on the dotted line, you need to go to the venue and really test it, and you need to convince the venue to agree to either let you change settings on the router as necessary or ensure a network engineer is onsite during your event and is authorized to make necessary modifications to the router.

Testing can be pretty straightforward: Take a notebook, plug it into the LAN, run traceroutes and pingplots to your anticipated game servers, and then run any of the common Internet speed tests (we like the DSLReports' speed test at www.dslreports.com/stest) to check the broadband speed. Ideally, do this several times throughout the day, and do it on the same days of the week you're having your event, which should give you a sense of the venue's Internet use patterns.



You'll quickly find that nonswitching hubs will wreak havoc on your LAN; using a tool like WireShark can help determine if you'll need to bring your own switches.

You should physically inspect (or get the model numbers of) the switches to ensure the venue is using a switched network. Alternatively, use a packet sniffer such as WireShark (www.wireshark.org). If you see lots of traffic, then the venue is using unswitched hubs; you'll need to bring your own instead. If you need more Ethernet ports than the venue has available, then plugging your own switches into its network is usually acceptable, but ensure the venue knows you'll be doing this.

Most newer hotels (and other buildings) use relatively modern networking equipment and routers, so their on-staff engineers can (and should) make requested changes, but if an older or smaller venue's equipment isn't suitable, ask if you can swap out yours for theirs for the duration of the event, or make the booking contingent on their upgrading their equipment. The venue should commit to these stipulations in writing before the event.

## Power It Up

Electrical bugaboos have been the source of more problems in LAN parties than even connectivity for two reasons. The first is that it can be a little hard to test beforehand. Secondly, if a venue has never scheduled an event full of power-hungry computers, venue owners just never give electricity a moment's thought. But you need to, and proper planning is the key.

"Most commercial venues have electrical circuits limited to 20 amps each," says Neese. "If you assume close to 600 watts per computer, then that limits you to four, or maybe five PCs per circuit."

Penna agrees, saying "Gamers use high-end PCs, with many using SLI (dual-video card setups); the more SLI rigs, the more power problems there are. Assume four amps per PC, but SLI setups can push that even higher."

Gaming laptops are becoming popular, and their power draw is significantly less—between 1.5 and 2 amps each.

Fortunately, there are things to do to mitigate power problems. First, get a detailed layout of the venue's electrical system. Get the number of available circuits, confirm the maximum amperage of each, work out how many computers each circuit can adequately supply, and then make sure you don't have any more PCs installed than the system can handle. If that means turning people away at the door, you may just have to accept that as an unfortunate necessity. If you can plan an early registration, having attendees identify their computers can help.

When laying out the room, make sure the different circuits are distributed evenly among the tables and then assign users their spots based on where amps are available. You can reinforce this by supplying your own power strips at tables and limiting players to two or three outlets unless special arrangements are made. Additionally, don't allow anyone to bring UPSes; these draw surges of electricity to charge their batteries at random times, frequently tripping breakers and bringing everyone else down.

You should also ensure ready access to the venue's circuit breaker box (or its engineering personnel) in order to reset breakers when they blow, which can still happen despite your best efforts.

## Is That It?

In terms of the hardware for a LAN party, broadband connectivity, a router, switches and cable, and a suitable, distributed power grid are the basic ingredients. Paying for them and organizing the event is another story, of course, but keep reading for some tips in that department, too. ▲

**by Warren Ernst**

# FOLLOW THE MONEY

When you see an advertisement for a LAN party or gaming convention, you probably aren't wondering how its organizers managed to pay for it all. If you have aspirations of running one yourself, however, it really should probably be the first question that pops into your head. Being the sensible types ourselves (and not being independently wealthy besides), it's the first thing that pops into *our* heads.

Fortunately for you, some of us here have some experience organizing large LAN parties and gaming conventions, and we also know folks who do it regularly. We even happen to know people at companies who occasionally help out LAN parties with sponsorship. We've put our heads together and talked to our sources and have put together some tips, ideas, and honest realizations that should help you organize and finance the large LAN party of your dreams.

## In The Beginning . . .

Unless you've inherited a building with a very large room with lots of tables and chairs, ample electricity, a broadband connection with a fat pipe, and a ready-to-go local-area network, then you're going to need some money to pay for these things. The obvious way to raise money for these things is to charge an admission price to attendees, but the owners of the things you need usually need either money up front or at least a contractual promise to pay immediately afterward—a definite Catch-22.

Sponsorship seems like it might be a good solution, but sponsors expect to get something in return for their investment, and most sponsors need a LAN party to reach a critical mass of attendees before they'll even consider sending help your way. Catch-22 again. What to do?

We think these situations explain some common trends among LAN parties: They started small and were initially self-funded. Fortunately for their organizers, the small size makes self-funding manageable, but these are still money losers, at least initially.

"[NETWAR] started off small, with buying the equipment and charging a cover," says Travis Kreikemeier, Internet coordinator for NETWAR Omaha (www.netwar.org), which now operates 26-hour-long LAN parties with attendance figures hovering around 200. "For the first three or four events," he continues, "it was a total money loss. Now it's sort of a 'break even' proposition. We've been doing it eight years now, and probably everything is now finally paid off."

Harry Mason, convention organizer of the Aces High Players Convention for several years, agrees. "[Getting started is] the really hard part. [Initial expenses] are all really out of pocket to get things rolling."

We've heard similar stories during informal talks with other LAN party organizers over the years. Most start with the organizer buying (or using previously purchased hodgepodge collections of) switches, Ethernet cables, power strips, and extension cords; hooking the network up to their existing router and broadband connection; and then setting up a few people in the garage, basement, backyard, or spare bedrooms.

"The nice thing about network equipment is that it all gets reused," says Mason.

Charging a small cover charge to help defray costs is appropriate at this level of LAN party, but not if you're asking attendees to bring their own networking and electrical equipment to piece the LAN together.

The other big LAN party expenses at this level are tables and chairs. These can be rented inexpensively at party/event supply stores, but like networking equipment, tables and chairs can be reused between events. Purchasing what you need to get started, and then adding as attendance grows, makes better financial sense in the long run.

## Getting Bigger, Getting A Venue

The next stage of LAN party evolution involves getting more space for the party, and spaces tend to break down into two categories: improvised meeting spaces and purpose-built meeting spaces. Surprisingly, one isn't inherently better than another, and also surprisingly, one isn't necessarily more expensive than another when the party's over. However, purpose-built meeting spaces tend to be located within hotels, and hotels are

# HOW TO PLAY (& WIN) THE LAN NUMBERS GAME

really set up to have people staying overnight (or nights) in hotel rooms, meaning that LAN parties at hotels tend to turn into conventions. But hotels have certain advantages over most improvised spaces, as we'll soon see.

Improvised spaces tend to be cheaper initially, but they also tend to have less infrastructure in place for LAN parties. "The biggest pain when moving venues is power and connectivity," says Kreikemeier, "but there can be other problems, too. Can we have an electrician come in? Can we add a junction box? We've had a lot of venues turn us away after all the requirements. [When venues are attached to restaurants], sometimes you need to make deals with catering." Many improvised spaces don't have a robust broadband connection either, so you need to either plan on bringing in connectivity on your own (at your expense, of course), or you need to plan on only running games that use a server that's hosted on your LAN. At NETWAR's current home, connectivity is supplied by three cable modems brought in by Cox Communications, which can be a significant expense, though in NETWAR's case, Cox is a premiere sponsor. (We'll cover sponsors in a little bit.)

Some improvised spaces work out pretty well, though. "Venues where bands play have the wiring all set up for what we need," says Kreikemeier. "We've also done it at family fun centers, where they have ample power set up for arcade games." One was located after hours at a McDonalds restaurant, where at least there were plenty of late-night snacks available.

Purpose-built meeting spaces at hotels usually have some sort of infrastructure (even tables and chairs) already in place, but it's up to you to ensure that it meets your requirements. We've already covered the technical requirements for electricity, broadband connectivity, and the LAN itself elsewhere in this issue (see page 64), but the nice thing about most hotels is that these elements are normally included in the room price, or can be negotiated into the deal.

"Everything is negotiable," says Mason, "even things such as the bar rate, (that is, the price attendees pay for food and drink at the hotel bar), service fees, and security."

Meeting rooms (even ballrooms) are generally priced against "room-nights." In other words, renting a ballroom (and its infrastructure) might cost $4,000 all by itself, but the price goes down for every block of guest rooms that are booked by attendees. For example, this hypothetical ballroom price might drop to $3,000 if your attendees book a total of at least 40 room-nights, $2,000 if they book 75, $1,000 if they book 100, and totally free and clear if they book more than 120.

As you can see, creating a multiday event is a little like playing chicken. The larger the event with a greater attendance, the more likely it will actually cost less in the end. But if enough people don't come out, or stay at the hotel, you're on the hook for potentially thousands of dollars because you've planned too big. Usually, the combination of registration fees and a venue discount for achieving some of your room-night goals results in a positive money maker, but you need to be prepared for things going wrong.

"You better be ready to take a bath," advises Mason. "You make commitments and sign contacts, and you're responsible for it. You've got to be ready to lose some money, and you can never go into [organizing a LAN] thinking you're going to make money. [This past year], with expenses running several thousand dollars [for our three-and-a-half-day convention], we actually made $285 overall."

Ultimately, knowing what your attendees want to experience should

TRENDnet®

There are plenty of manufacturers, such as Trendnet, that are willing to sponsor your LAN party and, in some cases, even provide you with gear that you'd otherwise need to purchase yourself. Don't be afraid to ask but be aware that your LAN typically needs a minimum number of attendees before sponsors will get involved.

Although piles of sponsors' swag won't offset the operating costs of your LAN event, it can be extremely helpful to draw new attendees in and keep current attendees coming back for more. (*Note: The Crucial goodies pictured here are shown for illustration purposes. Crucial's actual sponsorship package may differ.*)

help when selecting a venue. If people are simply looking to play a game as much as is humanly possible in one stretch, a single-day LAN party using an improvised space usually makes the most sense. If people are looking to socialize with each other and catch up with people they only see once a year (or less), then the purpose-built meeting space of a hotel could be the right choice.

## Get The Ball Rolling: Covering Startup Costs

With mention of how organizers should be ready to "take a bath" financially, you can probably guess how the vast majority of LAN parties get their seed money: Organizers usually pour in their own money.

"Getting started—that's the really hard part," says Mason. "It's all really out of pocket to get things rolling."

So what are some typical avenues for initial financing? There are several common ways: plowing in your own money or credit, finding several partners with whom you can pool resources, and requiring the paying attendees to prepay early during the planning stages. All of these require doing some basic math and following a plan to avoid a financial disaster.

Although you shouldn't count on making money with LAN parties, you should still try to determine if breaking even is even remotely possible. Some "back of the envelope" calculations usually suffice, and using other LAN parties as a guide is also helpful. NETWAR Omaha, for example, has around 200 attendees paying either $25 (if preregistered) or $40 (at the door). If half preregister, then the basic budget you have to work with is $6,500 ($2,500 + $4,000), which seems like a lot until you realize you need to rent a venue that holds 200 people, get broadband connectivity for 200 users, build a LAN that supports 200 computers, and find tables and chairs to seat 200 people.

The Aces High Convention has similar math: About 50 people paying $125 registration comes up to $6,250 for a four-day event at a hotel. Each attendee needs to stay over three nights, but some are locals or shared rooms, so figure 25 room-nights a night for 75 room-nights total. Because a hotel generally includes the entire infrastructure in its ballroom price, you need to calculate how 75 room-nights bring down the cost of the ballroom. Is it low enough that registration fees will cover it? Knowing the number of local attendees, who won't need a room, vs. out-of-town attendees, who will, can help you determine the amount of the hotel discount you can expect.

If you're reasonably confident that registration fees will come close to covering costs, then there's a chance you'll be able to recoup your initial seed money, which you'll need for things such as buying the LAN hardware (which is, of course, reusable), paying deposits on venues, prepaying the broadband supplier (if necessary), food or catering you may supply to attendees, and so forth. Even if suppliers don't need large deposits up front, doing this math should at least ease your mind when you're signing contracts committing to pay.

Having partners helps dramatically, especially when starting out with a new event. You divide up areas of responsibility (John handles the venue, Mike deals with the LAN, Bill handles the money and credit card processing, Pat takes care of the food, Chris gets the broadband, etc.), and everyone chips in startup monies to divide the risk. As a bonus, you won't be responsible for every single thing and might actually have a chance to enjoy the LAN party yourself.

Encouraging early registration is a good way to scrape together startup funds, and doing things to ensure you reach the maximum capacity of your venue helps the bottom line overall. A healthy early registration discount is one good way to get registration fees early. (Note NETWAR's 37% discount for early registrations.) Offering prizes to registrants drawn at random (either among early registrants and/or from anyone who registers) is another way to entice registrations. Sponsors can help with this in a major way, and in other ways, too.

## The Benefits Of Sponsors

Sponsors are companies (or, once in a great while, individuals) who agree to give you and your LAN party their

newegg.com®

ONCE YOU KNOW, YOU NEWEGG.®

**Voted Best Place to Buy Online**
6 Years in a Row! -Shopper's Choice Award

# Take control of your digital world.

**Top-of-the-line performance. Jaw-dropping realism. Command your PC's performance with VISION Technology from AMD.**

Experience explosive gaming performance with AMD Phenom™ II Black Edition processors and ATI Radeon™ graphics, with support for DirectX® 11. Expand your field of vision with up to 3 monitors, using ATI Eyefinity technology.[1] Accelerate your PC's performance to the max with AMD Overdrive™ software.[2]

BLACK
VISION
AMD

See. Share. Create.

**Shop for the latest deals on AMD Vision components at Newegg.com.**
www.newegg.com/amd

[1] Driver version 8.66 (ATI Catalyst™ 9.10) or above is required to support ATI Eyefinity technology and to enable a third display you require one panel with a DisplayPort connector. ATI Eyefinity technology works with games that support non-standard aspect ratios which is required for panning across multiple monitors. [2] AMD product warranty does not cover damage caused by overclocking, even when enabled using AMD OverDrive software
©2009 Advanced Micro Devices, Inc. All rights reserved. AMD, the AMD Arrow logo, ATI, the ATI logo, AMD OverDrive, AMD Phenom, Radeon, and combinations thereof are trademarks of Advanced Micro Devices, Inc.
DirectX, Microsoft and Windows are registered trademarks of Microsoft Corporation in the US and other jurisdictions. Other names are for informational purposes only and may be trademarks of their respective owners. PID #47685R

Also: newegg.ca™ neweggbusiness™

©2000-2010 Newegg Inc. All rights reserved.

Follow us on:
TWITTER twitter.com/newegghotdeals
FACEBOOK facebook.com/Newegg
MYSPACE myspace.com/newegg
YouTube youtube.com/newegg
EggXpert eggxpert.com

products, services, or monies in exchange for something that will increase their own business or brand awareness. Sponsors can help ease some of the financial burden of paying for a LAN party, but usually only indirectly.

"[These days], I just try to get a certain level of prizes [from our sponsors] so our attendees have something to look forward to," says Kreikemeier, which is a sentiment repeated by everyone we spoke with, and which jives with our personal experiences.

Is it possible to get a direct financial contribution from a sponsor to help out with costs? Well, anything is possible, but such gifts are extremely rare, especially today. "Larger events may request a (sponsorship) fee, says Zak Wood, director of global marketing at Trendnet, which sponsors dozens of LAN parties and gaming conventions every year. "They'll sell sponsorship levels, ranging from $3,000 to $10,000, and we generally stay away from that.

"Generally, we're happy to send items for prizes and swag, though we have also had people borrow equipment [for a LAN party], too."

When asked what he thinks TrendNet gets out of sponsoring LAN parties, Wood says, "That is a very good question. Networking isn't a field you'd think would want to sponsor a LAN Party. Mainly, we do it to capture the attention of early adopters, and we think LAN party folks are the early adopters we're looking for."

Wood might be on to something, as Kreikemeier told us stories of attendees winning items they never knew existed but came away impressed with once they were opened and played with.

Requirements for sponsorship, at least from TrendNet, aren't insurmountable. "The screening is pretty simple: Anything above 50 [attendees] is likely to get sponsorship," says Wood. "[LAN parties] with fewer [attendees] have less of a sponsorship chance. Actually, we establish contact with maybe 70% of the events we sponsor."

Now, we don't expect you to fill a venue as large as DreamHack's for your first LAN party, but doing your homework about a potential venue is vital. You should be realistic about the space and power requirements of your LAN when finding a venue. (*Photo courtesy of Toffelginkgo via Wikimedia Commons*)

Regarding other requirements, Wood says, "We require proof that the [TrendNet] logo is posted on the LAN party's Web site before stuff gets shipped out. And following the event, photos and pictures are appreciated, both of the event and of prize winners."

We didn't ask Wood these questions so that everyone reading this can hit up Trendnet for sponsorship but rather to get a sense of what you and your LAN party can offer a potential sponsor in exchange for some of its products. Namely, if your event is large enough, it can present a good opportunity to expose trendsetting users to new equipment or brands. Getting products to offer as raffle prizes or contest prizes is very possible and can help bring event excitement and attendance levels up. Borrowing a sponsor's equipment for the purpose of both running the event and demonstrating its abilities and qualities is a distinct possibility. But no matter what their level of involvement may be, sponsors expect you to actively promote the brand and its products to attendees.

Contacting potential sponsors can feel a little like asking someone on a date, but our experience shows that taking a personal risk when contacting sponsors out of the blue yields better results than a relatively riskless email or Web page form. Keeping in mind that the worst that can happen is that a company politely tells you "no thanks," we suggest the following tips when contacting potential sponsors. First, get your act together: Have your LAN party's Web site up and running and make sure it works fine and looks good. Second, make a phone call to a potential sponsor and ask to speak with someone in public relations, gamer relations (if it's a company that sells gaming products), or marketing. Third, politely and clearly identify who you are, what your event is, and what you would like in the form of sponsorship (items to raffle or offer as prizes, items to borrow or demo at your event, or, if you're feeling lucky, funding). Fourth, explain what benefits a sponsor would enjoy by helping you. And, finally, regardless of their response, thank them for their time, leave your contact info and Web site address, and ask them if you can contact them for a future event. They could very well monitor your event's Web site after the fact to determine if you're worthy of sponsorship in the future.

## Experience Counts, But It Isn't Everything

We know this can all seem daunting, so we have one more tip: If you can partner up with someone who has financed, planned, or even just helped with a LAN party before, do it. Misery may love company, but stress loves partnerships.

Still, there have been plenty of successful LAN parties started by inexperienced individuals, and you really can do it, too. Let us know how it goes. ▲

**by Warren Ernst**

# The Bleeding Edge Of Software

Inside The World Of Betas

## Snagit for Macintosh 0.6.1

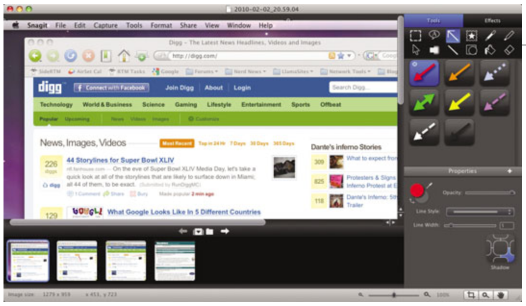
We know, we know. We don't normally cover Macintosh beta products, but it isn't often when a mature Windows product such as Snagit (which received 5 CPUs the last time we reviewed it, by the way) comes out with a Macintosh version. Also, the Mac beta version has a few tricks that its older brother, Snagit for Windows, lacks, so we're thinking that this is just a preview of what to expect from Snagit 10 on the Windows side.

Snagit is a screen capture program, which you might think is pretty silly for a platform that has a screen capture routine built-in the way Mac OS does, but Snagit has lots of tools to save time and ensure consistency, especially when you take a lot of screenshots.

The best is Active Window, a "smart capture" content selector. When you activate Snagit, the cursor becomes a crosshair that automatically selects whatever window it hovers over. If there's a scrollable area within the window, a Scrolling Active Window button automatically appears, and clicking takes a screenshot of the scrollable area's contents, as well—no cutting and pasting is necessary. If you just want to capture a region, just draw a rectangle around the area you want to capture, and a magnifying glass appears to help you crop the image correctly the first time. If you want to capture the whole screen, move the pointer up to the menu bar.

Like the Windows version, captures go to an editing window that contains lots of markup tools, such as arrows, "cartoon bubbles" for captioning, and cursors. Unlike the Windows version, the Effects tab only has a Coming Soon label instead of tools that can add depth, colorize, blur, and so forth. Well, that's what betas are for, right?

There's also a library tool, which keeps track of all the captures you've ever made, and it exports captures to BMP, PNG, GIF, TIF, and JPG formats, supporting transparency when formats allow it. ▲



**by Warren Ernst**

**Snagit for Macintosh 0.6.1**
**Publisher and URL:** TechSmith, www.techsmith.com
**ETA:** Q4 2010
**Why You Should Care:** The best screen capture program finally comes to the Macintosh.

## Stellarium 0.10.3

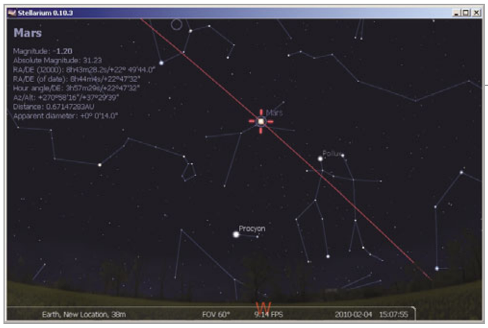
Have you ever looked into the night sky and wondered exactly what you were seeing up there? Sorry "X-Files" fans, but we're talking about stars, planets, nebulae, constellations, and even the Milky Way. And when it comes to planetarium software, there's simply nothing as good as Stellarium that can match its low, low price of free.

Stellarium employs 3D acceleration to accurately re-create the heavens and even some Earth, too, creating a faux horizon that helps find things in the sky. Just give Stellarium a location to "observe" from, along with a date and time, and Stellarium shows on-screen what you'd see. For extra fun, you can also choose locations you'll probably never be able to get to, such as the North Pole or Antarctica, the Moon, other planets, and regions of space.

Feeling a little bit like a game, Stellarium lets you navigate by simply dragging the mouse cursor around; the universe responds instantly (there's no lag even on fairly low-powered notebooks), giving you a surprisingly fluid and intimate interaction. Use your mouse's scroll wheel to zoom in and out, which generally displays more stars. The default star chart includes 600,000 stars, but an optional database download increases this to 210 million, meaning you can zoom in to a lot of detail.

Options abound in Stellarium. Turn light pollution on or off. Display either stick-figure versions of constellations or the fanciful cartoon versions. Enable or disable planet paths. Display satellites and their paths, too. Use the Search command to find specific heavenly bodies; the program rotates the Earth and sky directly to it, assisting you in locating it yourself. Should you have a computer-controllable telescope (and several models and interfaces are supported), you can tell Stellarium to point it for you instead.

Though the Help file is a little sparse and the interface a little irregular, we find Stellarium utterly captivating. We think you will, too. ▲



**by Warren Ernst**

**Stellarium 0.10.3**
**Publisher and URL:** The Stellarium Project, www.stellarium.org
**ETA:** Q4 2010
**Why You Should Care:** The best free way to look at the stars short of going outside.

# UP TO SPEED

## Upgrades That'll Keep You Humming Along

This is a good month for hardcore PC users who like to benchmark their rigs (with 3DMark06 and Fraps updates), stay hyper-connected (AIM and Trillian), and download massive files (with µtorrent and Xtorrent). Mac users receive a treat, as well, with a more Windows 7-friendly version of Boot Camp.

## Software Updates

### Futuremark 3DMark06 v1.2.0 1901

The widely used 3D graphics benchmarking and diagnostics tool updates the System Info component to version 3.21.2.1. It has also fixed the CPU Test Novodex thread search when there are more than 32 threads.

www.futuremark.com

### AIM 7.2 Beta

A major new feature of AOL's instant messenger client is Facebook integration. AIM now has a Facebook Connect button that lets you add your Facebook friends to your AIM Buddy List. For times you need to fly under the radar, setting your AIM status to Invisible will make you appear offline to Facebook friends.

beta.aol.com

### Apple Boot Camp Utility For Windows 7 Upgrade

This new tool from Apple lets Boot Camp 3.1 users upgrade their Windows Vista OS installation running on a Mac to Win7 without tripping the current error code. The upgrade unmounts the read-only Macintosh volume so Win7 can complete its upgrade.

support.apple.com

### Evernote For Windows 3.5.1

The increasingly popular note-taking software and repository now lets you hide the note editor and the interface's left-hand panel. Evernote adds multitouch support in this release and the ability to enable/disable spell checking. Previous problems involving crashes on WinXP, tagging notes in the notes editor, and deleting attachments have been resolved.

www.evernote.com

### Fraps 3.1.1

The cool tool for benchmarking your videogaming and capturing in-game footage adds product information to the installer. Days earlier, the Fraps 3.1.0 release added the option to capture video even with the game frame rate unlocked and to record at 1fps for time lapse video. It also fixed a problem loading the program on i5- and i7-based Win7 machines.

www.fraps.com

### Apple iTunes 9.0.3

The update for Apple's ubiquitous media library/store now will actually remember the Remember Password For Purchases setting. It also fixes problems with syncing Smart Playlists and podcasts with iPods. This version also cures a device recognition problem.

support.apple.com

### Microsoft .NET Framework 4 RC

The foundation for the many applications using .NET nears a full 4.0 release. Among the many improvements for developers are changes in the Visual Basic and C# languages that add new programming statements. There is WPF (Windows Presentation Foundation) support for the Surface 2.0 SDK and Win7 multitouch and ribbon controls.

www.microsoft.com

### OpenOffice.org 3.2.0

The open-source office suite gets scores of updates. Context menus have been enhanced in the charts module. The ALT-key modifier is now available in the keyboard shortcut configuration tool. In addition to new local language support, the open-source office suite now checks after an upgrade to ensure that older extensions are still compatible.

www.openoffice.org

### Cerulean Studios Trillian 4.1 Build 24

This popular IM client lets you chat across different messaging services and accounts. The update to the 4.1 release fixes crash bugs related to AIM and Google Talk connections. This release also offers a workaround that gives the client access to Facebook Chat.

www.trillian.im

### BitTorrent µTorrent 2.0

Among the assorted bug fixes and performance improvements, the popular torrent client has added UDP tracker support. The setup dialog has been streamlined and includes a speed test. The transfer cap feature tracks your bandwidth usage via graphing.

www.utorrent.com

### xtorrent 2.0 (v96)

The very stylish torrent client has been iterating its 2.0 release with multiple releases and updates. This update adds "cluster results" that group your downloads by the search site that delivered them. Another very recent version (v94) of the 2.0 software added a Quick Look feature, which can preview many content types before they finish downloading.

www.xtorrent.com

## Driver Bay

### AMD ATI Catalyst 10.1

The latest drivers for Radeon HD series cards improve performance in Left 4 Dead 2 and Crysis for HD 5700 and HD 5800 series cards. A problem playing YouTube videos in Firefox has been resolved under Win7. The 120Hz setting is now visible on relevant digital displays.

ati.amd.com

**by Steve Smith**

Kingston
TECHNOLOGY
HYPERX

Move at the speed of X.

Looking for an edge over the competition? Kingston's HyperX® memory has the speed and performance you crave for desktops, notebooks and servers. Available in DDR, DDR2 and DDR3, HyperX modules are specifically engineered and tested for higher speeds and latencies. They're backed by 24/7 tech support, a lifetime warranty and legendary Kingston® reliability, so the only question is: Are you ready to move at the speed of X? Visit **kingston.com/hyperx** to learn more. Find us on Facebook: Kingston HyperX.

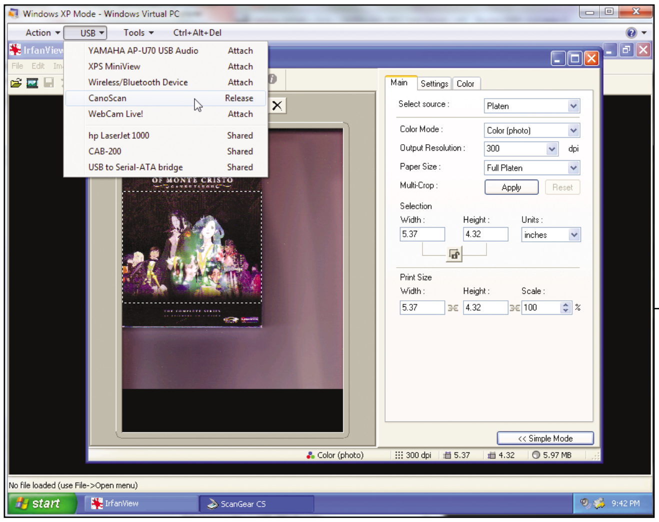
ISO 9001:2000 SGS SYSTEM CERTIFICATION

©2010 Kingston Technology Corporation, 17600 Newhope Street, Fountain Valley, CA 92708 USA. All rights reserved. All trademarks and registered trademarks are the property of their respective owners.

kingston.com/hyperx

# Virtualization For The Rest Of Us

## Out Of The Enterprise & Into The Home



Select source : Platen
Color Mode : Color (photo)
Output Resolution : 300 dpi
Paper Size : Full Platen
Multi-Crop :
Selection
Width : 5.37 Height : 4.32 Units : inches
Print Size
Width : 5.37 Height : 4.32 Scale : 100 %
Color (photo) 300 dpi 5.37 4.32 5.97 MB
No file loaded (use File->Open menu)

A full-windowed version of Windows XP Mode in Windows 7. Note the USB selector, which has the CanoScan scanner device attached for use in the VM.

Until recently, virtualization was either a tool only for IT professionals or a plaything for those who could afford a machine beefy enough to run it. But now that memory and disk space are dirt cheap and most every PC sold can support hardware virtualization, it's something most everyone can use. In this article, We'll show you several handy things you can do with virtualization.

### Defeat Driver Conundrums

Ah, the agony of upgrading to a new OS only to find that some of your hardware is rendered useless because there's no driver support under the OS. This problem has become especially acute with the ongoing transition from 32-bit to 64-bit Windows. Many older devices don't have 64-bit drivers; they may never have 64-bit drivers.

We recently discovered this when our printer and scanner wouldn't work on a 64-bit Win7 installation. We had three choices: replace both devices (expensive), stick with the 32-bit version of Windows (a waste in a system with 4GB of RAM and climbing), or use virtualization. We went with option 3 without blinking, and it's paid off.

Win7 Business and Ultimate provide a tightly integrated way to use 32-bit device drivers called Windows XP Mode. WinXP Mode was designed with this kind of work in mind, both in terms of its under-the-hood technology and the way that tech is made available to the end user.

The idea's simple: WinXP Mode uses a virtualized copy of 32-bit WinXP to handle device driver duties. When you plug a device into your machine and let XP Mode "see" it, WinXP Mode uses the original 32-bit device driver (which you provide) to talk to the device and allow it to work with programs. Note that the only programs that will work with those devices are programs you run in WinXP Mode itself.

There are two ways to launch programs in WinXP Mode. The first is in a window that contains the whole virtual machine's Desktop, which requires a fair amount of screen space. Here, you attach a device to the virtual machine by clicking the USB drop-down at the top of the window and selecting the desired device. (It may take a few seconds for the VM to recognize it as being attached.)

You can also launch a program in a self-contained window directly on your host's Desktop. To attach a device here, you'll need to right-click the program's icon in the Taskbar (it might not have the icon you recognize, so look carefully), select Manage USB Devices, and then attach the devices needed in the next window. Currently, there's no way to "auto-attach" a USB device, although many have requested it.

If you attach a device to WinXP Mode and don't hear the sound that signals a new device being attached, something went wrong. You'll need to close and restart the virtual machine, and try again. WinXP Mode also doesn't support PCI add-in cards, so things such as PCI-based video capture cards won't work.

Obviously, WinXP Mode isn't the only virtualization system that lets you use 32-bit drivers. If you want to run 32-bit WinXP in Oracle's VirtualBox (www.virtualbox.org) or VMware's VMware Player (www.vmware.com), you can use both of those to access devices, too. VirtualBox and VMware Player both support USB auto-attaching, but neither are perfect solutions. VirtualBox's USB device support can be flaky, and it has trouble managing the state of the device if, for instance, the virtual machine is suspended/resumed and the device disconnected and used by the host PC in the meantime. VMware Player is a little more reliable about such things and also supports auto-attach, but in my experience is markedly slower than the other programs.

Several other factors can affect the reliability of USB-attached hardware. Devices connected through an external hub, powered or unpowered, are a bit flakier than devices plugged directly into the computer. Devices that must connect through other devices (for example, a printer that has a parallel-to-USB adapter) can be tricky. VirtualBox, for instance, has trouble with such devices. It sees the printer but doesn't understand that the adapter also has to be attached to use the printer; you have to attach both devices and cross your fingers.

## Play In The Sandbox

Virtual machines are, by definition, isolated from the rest of one's computer. That makes them a powerful way to test programs in a totally self-contained way.

If you're using a virtual machine system that lets you take snapshots of the virtual machine's system state (such as VirtualBox), you can use this function as a way to preserve a "clean" copy of the OS. When you bring an app in for testing, make a snapshot first, then install the app and test. When you're done, dispose of the snapshot, and the system reverts to its presnapshot state. This way, you automatically dispose of everything associated with the program—Registry entries, program directories, user and system files, device drivers, and user data. The whole enchilada.

One way to obtain an already clean OS for testing (apart from installing it yourself) is to download one of Microsoft's Internet Explorer Application Compatibility Virtual PC system images (bit.ly/7bcr8). These are disk images in VHD (Virtual Hard Disk) format that contain fully functional copies of WinXP or Vista. Nominally they're used for testing compatibility with specific versions of Internet Explorer, but they can be pressed into service for this sort of thing just as easily.

It's important to note that the virtual machine will only be usable for 120 days once created—although newer editions of these virtual machines are being created constantly, so you needn't do more than download the newest version and unpack it when the old one expires.

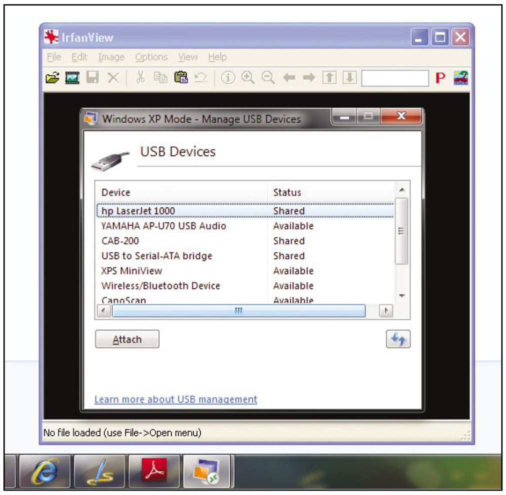
Bear in mind that while a virtual machine starts as being isolated, that doesn't mean it always remains that way. It's easy—sometimes too easy—to give a virtual machine access to your computer at large. Two of the most common ways this can happen are networking and host/guest integration services.

We all know that giving network access to any computer is automatically a security hole, but host/guest integration services might be a little less familiar. Integration services are applications and driver packs that run on both the guest and host computers, facilitating things such as drag-and-drop or clipboard sharing between both. You can see how having such things active might easily turn into a conduit for malware in either direction. If you do install integration services on a guest, approach them with caution, especially if the goal with the VM in question is security and not convenience.

For those who can't run a full-blown virtualization app, there's another program that provides something nearly as good: Sandboxie (www.sandboxie.com). As the name implies, this lets you run other apps in a "sandbox," where all access to the rest of the system—especially the hard disk—is isolated.

## Virtualization As Preservation

If you have an older computer whose state—not only data but also application functionality—you're trying to preserve, consider migrating it to a virtual machine as a way to keep it running. You can also do this for machines that you fear have been compromised in some way, e.g., through a virus attack, and which you want to test or examine in some isolated fashion.


IrfanView
File Edit Image Options View Help
P
Windows XP Mode - Manage USB Devices
USB Devices
Attach
Learn more about USB management

| Device | Status |
|---|---|
| hp LaserJet 1000 | Shared |
| YAMAHA AP-U70 USB Audio | Available |
| CAB-200 | Shared |
| USB to Serial-ATA bridge | Shared |
| XPS MiniView | Available |
| Wireless/Bluetooth Device | Available |
| CanoScan | Available |

No file loaded (use File->Open menu)

A Windows XP Mode application (in this case, Irfanview) running right on the desktop. The Manage USB Devices window lets us attach hardware to this program.

There are two ways to do this, but be aware that each requires that you attach the hard drive for the system to a computer capable of running the virtualization software.

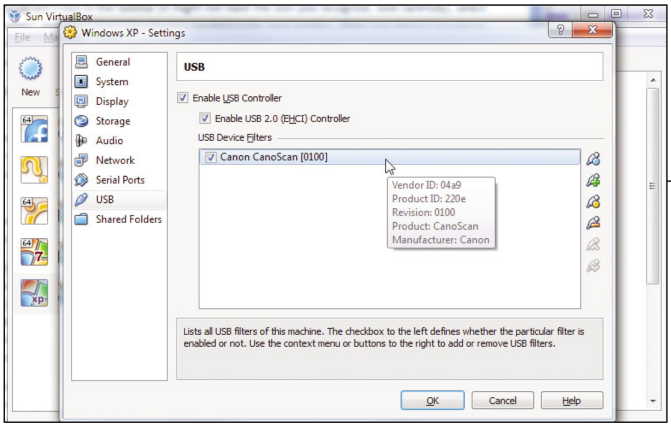
The first technique is making a bit-for-bit copy of the hard disk to a virtual hard drive file. A utility from Microsoft called Disk2vhd (technet.microsoft.com/en-us/sysinternals/ee656415.aspx) lets you perform just such a migration. It reads an attached drive and migrates the drive to a .VHD virtual disk file. Even more interestingly, it can migrate a Windows system while it's online by using Windows's own volume-snapshot system. Obviously if you're migrating a system that you don't want to boot in the first place, you'll want to mount the drive from another instance of Windows—but this is a handy feature to have if you want to try taking snapshots of a live system.

Speaking of snapshots, that is in itself another powerful thing you can do once you've converted a physical machine to a virtual one. If you're using a VM program that supports snapshotting, you can preserve the state of the machine from further changes—either changes you've made, or changes which might happen as a result of something being wrong (again, a virus on the machine, etc.).

If you're using a VM program that doesn't support snapshotting, you can always accomplish the same thing the low-tech way: make a backup copy of the VHD file and use the backups (not the originals). To speed up the copy process, copy from one physical drive to another connected to the same machine rather than making a copy on the same physical drive.

## Sample Another OS

The most common way to try out another operating system on a given machine is to dual-boot, but there are a bunch of downsides to dual-booting. It often requires changing partitions



☑ Enable USB Controller

☑ Enable USB 2.0 (EHCI) Controller

USB Device Filters

☑ Canon CanoScan [0100]

Vendor ID: 04a9
Product ID: 220e
Revision: 0100
Product: CanoScan
Manufacturer: Canon

Lists all USB filters of this machine. The checkbox to the left defines whether the particular filter is enabled or not. Use the context menu or buttons to the right to add or remove USB filters.

VirtualBox lets you automatically attach devices to virtual machines when they're started.

(something that still makes people uneasy, and we don't blame them); it only lets you run one OS at a time (bad if you're trying to get actual work done in the meantime); and it can be a pain to undo. A virtual machine's a lot less disruptive than dual-booting, and lets you share data between the "old" and "new" systems a great deal more easily.

One very important point: Don't use virtualization to gauge the performance of the other OS. Everything is slower in a virtual machine—not necessarily dramatically, maybe not at a glance, but it will make itself known. Gaming or multimedia will almost certainly not run at native speeds, not even if you have hardware-assisted virtualization or guest device drivers. That said, doing this will give you a good idea of what to expect from the system.

There is one major advantage that dual-booting provides over virtualization. If you like the new system, you can simply continue booting to it and use it normally. It is possible to convert a virtual machine to a physical one, but it takes a certain amount of manual effort. It's not something that's possible with a single command or tool. VMware has some documentation on this process (bit.ly/5c3MG0) but provides it "for information only." Don't expect any hand-holding from VMware. Your best bet may simply be to install the new OS clean rather than fight against the odds of physical vs. virtual architectures.

## It's Ready Now

Most every technology that's been introduced for the PC eventually gets boiled down into a consumer implementation of some kind—multiple processors, 64-bit OSes, Gigabit Ethernet, and now virtualization, too. It may be awhile before VMs become so tightly integrated into our end-user experience that we never even realize we're using them. But until then, we can still get a lot out of virtual machines with a little effort. ▲

**by Serdar Yegulalp**

## Virtualization General Tips & Tricks

### 1. Install and use guest services.

As the name implies, guest services are programs that run on the guest or virtualized OS, which allow a greater level of integration between it and the host OS it's running on. This could include things such as allowing better management of the screen, or clipboard sharing (e.g., letting you copy and paste between the two machines) or sharing network folders. This last has been somewhat eclipsed by the Homegroup and Libraries features in Windows 7, but Win7 is hardly the only OS out there.

Most guest services can be installed semi-automatically by the VM software you're using. Typically, the VM program attaches a virtual CD volume to the guest, from which you can run and install the guest service apps.

We mentioned earlier that guest services are something you want to be wary of if security and isolation are your main priority, but if you're not worried about that, they make managing a guest machine a lot easier.

### 2. When possible, keep virtual machines on a different physical drive from your main OS.

Most virtual machine apps will, by default, create the files for a given user's virtual machine in the user's profile directory. This can be a performance issue. The files used to store a virtual machine's disks (and, whenever possible, its state) should ideally be placed on a different physical disk than the one that holds the host OS. Disk access will be faster to and from a separate disk than it will be from the same disk, since the VM and the host OS won't be competing for the disk. Each will have its own I/O on a different physical channel.

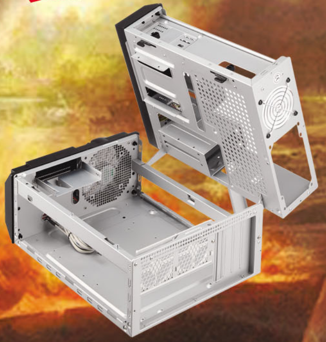
### 3. Keep commonly accessed volumes on your local machine.

If you have app or OS installation CDs or DVDs which are commonly used with one or more virtual machines, keep them stored on your local machine as an ISO file. Typically, you'd connect the virtual machine directly to a CD/DVD drive and access the disc that way, but this is slow—as slow as, and never faster than, doing the same thing on the host machine. Any discs that might be used more than a couple of times should be ripped to an ISO (via a program such as ImgBurn) and accessed that way. The time spent in copying the disc will be more than made up by the speed gains when actually using it for an install process.

# Qx-2000

Aero Cool
www.aerocool.us

Double Decker



*Be cool! Be Aerocool!*

PGS V · PGS R · PGS S · PGS B · PGS Q

High performance "Cube" case for gamers and enthusiast
Supports Micro-ATX MBs.
0.6mm SECC Japanese Steel.
Supports longer high-end VGA cards up to 300mm.
Supports 2 x 5 1/4" devices (extenal), 1 x 3 1/2" device (external) and 2 x 3 1/2" HDDs (internal).
Supports standard ATX PSU – 140mm prefer length but can support up to 160mm.
Screw-less kits are provided for the 5 1/4" bays.
2 x USBs and Audio/Mic (AC 97 + HD Audio)
Fan controller with LED color switch

Bx-500

Touch-1000

Touch-2000

V12XT

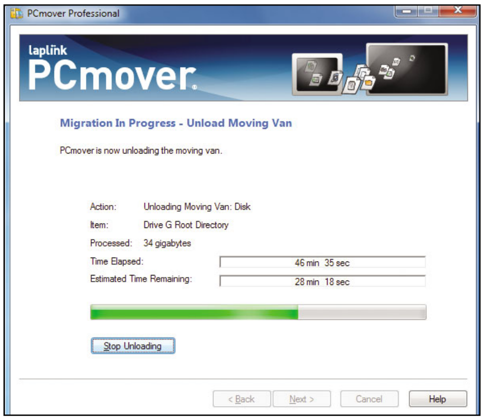
Authorized dealers

---

Fry's Electronics · newegg.com · TigerDirect.com · Micro Center computers & electronics · ZipZoomfly · the all-new CompUSA.com · FrozenCPU.com · Xoxide · Circuit City.com

DIRECTRON.COM · NCIX.com · performance-pcs.com · CASE-MOD.COM · Sidewinder Computer Systems Inc · ATXCases.com

# Laplink PCMover Professional



Migration In Progress - Unload Moving Van

PCmover is now unloading the moving van.

Action: Unloading Moving Van: Disk
Item: Drive G Root Directory
Processed: 34 gigabytes
Time Elapsed: 46 min 35 sec
Estimated Time Remaining: 28 min 18 sec

If you were a power user in the DOS days, then you probably used Laplink and its special parallel port cable to transfer files too big to fit on floppies between two computers. It was revolutionary. Needless to say, today's Laplink PCMover is a very different program, yet it performs essentially the same task, but with much more smarts and many more transfer options. (Today's optional Laplink cable is either USB or Ethernet.) And it's no less revolutionary.

PCMover lets you transfer all of the personal data files (such as Word docs, MP3s, photos, movies, email, etc.) and optionally all of your programs from one computer (or Windows installation) to another, even between different versions of Windows. In other words, you can transfer all your programs and data from an old computer running WinXP to a new computer running Win7. Alternatively, you can even transfer your apps and data from WinXP to Win7 on the same computer once you reformat the drive and install the new OS. When upgrading a single computer, it's best to have a portable USB hard drive to act as the "moving van" for your stuff, but multiple computer scenarios can use your LAN, a crossover cable, or the special Laplink USB cable to do a direct transfer.

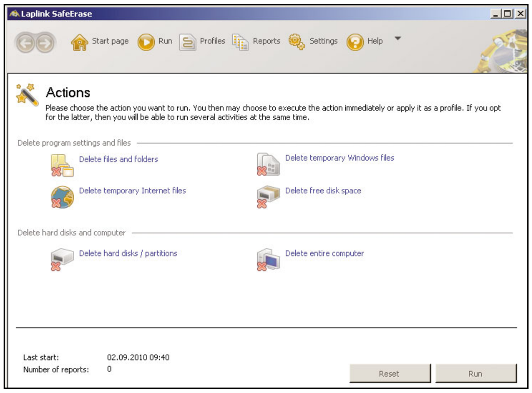
Although there are some caveats, the amazing thing is that PCMover actually works very well. Data files spread all over a WinXP's filesystem were neatly organized in Win7's Libraries in our testing. Complex programs such as Office 2007, Firefox, and Adobe CS4 also transferred over completely, though some needed reactivation. PCMover won't magically make incompatible software suddenly compatible in Win7, but we found current versions of software generally worked fine.

Certainly you could manually copy your files and reinstall your applications, but PCMover's common-sense wizards and detailed options let you spend a few minutes going over settings just once, and then the actual transfers (which took a few hours via USB drives) work on their own. If your time is valuable or you don't trust yourself to find all your data and installation discs, PCMover is worth the price. ▲

**by Warren Ernst**

**PCMover Professional**
$59.95
Laplink
www.laplink.com
●●●●◖

# Laplink SafeErase 4.1


Laplink SafeErase
Start page
Run
Profiles
Reports
Settings
Help
Actions
Delete program settings and files
Delete files and folders
Delete temporary Windows files
Delete temporary Internet files
Delete free disk space
Delete hard disks and computer
Delete hard disks / partitions
Delete entire computer
Reset
Run

Please choose the action you want to run. You then may choose to execute the action immediately or apply it as a profile. If you opt for the latter, then you will be able to run several activities at the same time.

Last start: 02.09.2010 09:40
Number of reports: 0

In case you hadn't heard, the Windows Recycle Bin (and the command line's Delete command) doesn't work like you might expect. In fact, when you delete files with these methods, the space on the disk where the file resides is merely marked as "available for new files," meaning that the contents of the original file might be available for review and recovery until a new file overwrites the old one. This can be a significant security hole, and Laplink's SafeErase is a good way to plug it. However, we aren't convinced it's the best way for a few minor reasons.

SafeErase actually overwrites the files you delete with it with data, with varying amounts of randomness (or zeros or ones) in varying numbers of passes. There are five government-approved deletion algorithms available, offering more secure deletion methods in exchange for more time. To use it, you either right-click a file or folder and choose Securely Delete from the pop-up menu, or you run SafeErase itself and manually select files for deletion. Files deleted even with the quickest method were rendered invisible to several data recovery tools we tried, which we consider a success.

That said, we have two reservations, and both relate to its interface. The first is how you must go through a Simulate Or Delete Now screen when you right-click a file to erase it; you must then go through a report screen once it's finished—every time. It becomes annoying after awhile. The second is that the main SafeErase window has a link to erase your entire hard drive on its main screen. We're not saying this isn't a useful feature (it is) or that it doesn't work (it does), but it seems too accessible for such a powerful, un-undoable command. Imagine a bored kid inadvertently destroying all of a family's data.

Another potential problem: The essentially similar open-source program Eraser is totally free and is in many ways quicker to use with fewer interruptions and confirmation screens.

Still, Laplink offers customer support for your dough, and it's undoubtedly effective, making it worth a look if you find Eraser unsuitable. ▲

**by Warren Ernst**

**SafeErase 4.1**
$29.95
Laplink
www.laplink.com
●●●

**CPU RANKING** ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

# Open Sores

## Mobile Apps Get WAC-ed

What happens when you bake a delicious Apple pie and then refuse to share it with your neighbors? The neighbors band together and try to wrest it from your stubborn hands. At least, that's what's presently happening in the world of mobile apps and software.

### Apple's Gated Ecosystem

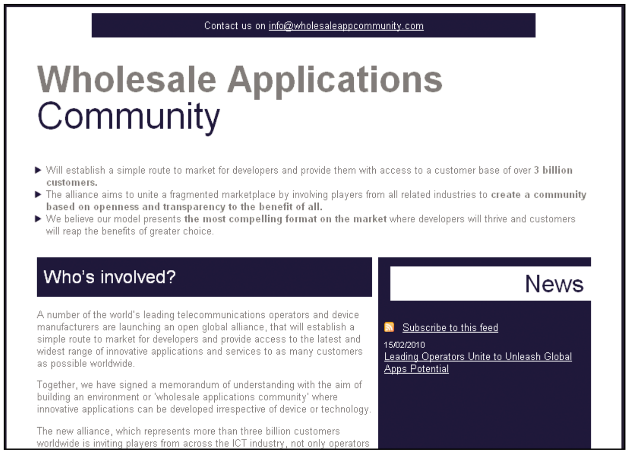
Apple has done a remarkable job of creating and subsequently hoarding the lion's share of the mobile software market with its App Store and iPhone and iPod touch devices (which run on the iPhone OS). The problem for other companies vying for a slice of the mobile market pie is that Apple has cut out everyone except a few select partners.

Apple controls everything but the plumbing. It has its own hardware devices, operating system, application (iTunes), and content, and all of the parts work together with impressive ease. If Apple could afford the infrastructure, it probably would have preferred not partnering with AT&T as the mobile carrier for the iPhone.

In short, Apple dominates mobile right now, and the company has no plans to unlock its hardware or allow its OS or software to work on anything other than an Apple-branded device. With the impending release of the iPad and its iBooks app, the fruit company is looking no doubt to kick the ereader industry around, as well.

Predictably, the rest of the mobile industry is unhappy about this situation. Plenty of other companies have entered the mobile OS and app fray, including Google, BlackBerry, Palm, Windows, and Nokia. (The latter recently merged its Maemo platform with Intel's Moblin to create MeeGo, an open mobile platform.) Some are vertical models like Apple's, and some, such as Android and MeeGo, are open-source.

However, mobile carriers worldwide are apparently getting into the mix, as well.



Contact us on info@wholesaleappcommunity.com

Wholesale Applications Community

- Will establish a simple route to market for developers and provide them with access to a customer base of over **3 billion customers.**
- The alliance aims to unite a fragmented marketplace by involving players from all related industries to **create a community based on openness and transparency to the benefit of all.**
- We believe our model presents **the most compelling format on the market** where developers will thrive and customers will reap the benefits of greater choice.

Who's involved?

A number of the world's leading telecommunications operators and device manufacturers are launching an open global alliance, that will establish a simple route to market for developers and provide access to the latest and widest range of innovative applications and services to as many customers as possible worldwide.

Together, we have signed a memorandum of understanding with the aim of building an environment or 'wholesale applications community' where innovative applications can be developed irrespective of device or technology.

The new alliance, which represents more than three billion customers worldwide is inviting players from across the ICT industry, not only operators

News

Subscribe to this feed

15/02/2010
Leading Operators Unite to Unleash Global Apps Potential

The Wholesale Applications Community plans to create an open platform for the development of device-, OS-, and carrier-agnostic mobile and Web apps.

### The Wholesale Applications Community

At the Mobile World Congress in Barcelona recently, an alliance of 24 mobile carriers including AT&T, Verizon Wireless, Sprint, Deutsche Telekom, Orange, China Mobile, and Vodafone (as well as hardware manufacturers Samsung, LG, and Sony Ericsson) announced the formation of the Wholesale Applications Community (www.wholesaleappcommunity.com).

The WAC portends to create an open platform for the development of mobile and Web apps that will be device-, OS-, and carrier-agnostic. Together, this alliance represents an impressive 3 billion customers worldwide, or almost half of the earth's total population.

The idea is that such a platform would make it easier for developers to get their product to (a very large) market and take advantage of all the perks of an open-source community project. Of course, such a proclamation makes for a good headline, but it begs some questions. The most obvious one is how exactly they plan on accomplishing this heady goal.

The group is pursuing a common standards-based approach in cooperation with the World Wide Web Consortium (www.w3.org) and plans to have a standard within a year. The group will employ Joint Innovation Lab (www.jil.org) and Open Mobile Terminal Platform (www.omtp.org) BONDI to develop the new standard.

(JIL is a platform for creating mobile services developed by China Mobile Limited, SOFTBANK, Vodafone, and Verizon Wireless. OMTP, also founded by a group of mobile service providers, offers BONDI, an application runtime for mobile devices.)

That's all well and good, but one remains skeptical about the viability of such a venture. Microsoft experienced (or caused, depending on how you look at it) its share of consternation getting the various iterations of Windows Mobile to work properly on every device it was supposed to support. Now, it appears that the company is starting its mobile endeavors over from scratch with the Windows Phone 7 Series. Presently, Android seems to be experiencing some problems with compatibility, as well.

And perhaps this is unfair, but the hastily thrown-together WAC Web site alone is a cause for concern, like trying to take your friend seriously when he launches a blog on Jan.1st. ("This year, I'm going to blog every day about whatever's on my mind!") Clearly, WAC wanted to make its big announcement at the Mobile World Congress in February and may have rushed a little on the negotiations, but was creating a more complete and permanent-looking Web site so difficult? And how does that reflect on the monstrous project it's about to undertake?

Granted, one would be wise to withhold snap judgment; it's not an impossible task, but at best it will probably be a long, drawn-out process, and at worst, a washout. Time will tell. At the very least, it's an intriguing development. After all, the Internet, the biggest, baddest, most successful open-source project ever, is already carrier- and platform-agnostic.

## Speaking Of The Internet...

All this talk is of mobile apps that will run locally on mobile devices and will also interact with the Web. For that local usability, of course, you have to have an operating system and applications that can run on it. But virtually all of those apps can be and frequently are run as Web apps.

And who controls Internet access? Increasingly, mobile carriers have a say in that. Although most people rely on home networks and Wi-Fi hotspots for Internet access, 3G is slowly becoming more prominent. Furthermore, when and if these carriers ever get around to building out 4G networks to serve a meaningful number of people, more people will have access to incredibly fast mobile Internet. Cable providers may have the Internet provider market cornered in homes and businesses, but to get 3G service (and presumably 4G someday), you have to fork over a bundle of cash to a mobile provider. Thus, carriers will hold the keys to the locked door of mobile Internet access.

At this point, two of the main hurdles to using Web apps in mobile devices have been bandwidth issues and the lack of support for technologies such as Flash. The mobile carriers are the ones with the ability to alleviate the first problem.

With a little less restriction of their Internet usability, devices like the iPad could prove indispensible.

For the second, Adobe has announced Flash Player 10.1, which is supposed to deliver Flash capabilities to mobile devices and should be widely available sometime this year.

Several companies, including Apple and Google, are looking to HTML5, though. Among other things, HTML5 holds the promise of eliminating the need for third-party applications such as Flash. When exactly that functionality will become available and widely implemented, though, is anyone's guess.

Regardless, Google seems to be on the Web apps bandwagon. According to Financial Times, at the MobileBeat conference in San Francisco in July, Google Engineering VP Vic Gundotra indicated that Google saw the Web as the future, not mobile apps. This would explain the slightly paradoxical existence of both Android and Chrome OS; one is for now, one is for the future.

Chrome OS, then, represents the possibility of bypassing the mobile OS and related app store conundrum altogether and looking to something else entirely. An operating system that's designed to operate, essentially, as a browser-as-an-OS. Whenever it's released in full, Chrome OS should be lightweight and provide a rich Web experience whether you're browsing, emailing, using productivity applications, or doing whatever else it is that you need to get done.

If the Internet becomes a little more "unlocked"—that is, if we see greater support for Flash and other similar applications and/or see HTML5 unleashed—the whole mobile landscape could change drastically. This brings us back around to a vehemently vertical operation like Apple.

For example, the iPad, a device whose overall usefulness is questionable, locks the user into Apple's mobile ecosystem (as in, its OS and applications) and has no Flash support for meaningful Web application use. You're stuck with whatever Apple wants you to have in terms of hardware and content. But if access to Web content was uninhibited by not needing Flash at all, it wouldn't matter; you'd have yourself a lightweight device with a screen of ample size from which you can access all the treasures of the Web. You can find virtually anything you need online for a rich computing life, including email, productivity applications, storage, and even Web OSes.

For more CPU-intensive applications such as gaming, media editing, and video rendering, you probably won't be able to ditch your desktop computer anytime in the foreseeable future, but augmenting your stable of computers with a tablet-like tool running on something like Chrome OS might be indispensible, too, albeit probably not for several years.

**by Seth Colaner**

Windows®. Life without Walls™, CyberPower recommends Windows 7

**AMD**
The future is fusion

# Create the PC
## OF YOUR DREAM

**Techsupport**
All Desktop systems come with
3 year Limited Warranty +
lifetime toll free techsupport
**Order Toll Free 800-707-0393**

**FREE Liquid Cooling**
on all systems

ATI RADEON GRAPHICS

AMD Phenom™ II X4

AMD 790X Chipset

AMD Phenom™ II processors deliver maximum headroom, for The Ultimate Visual Experience™ for HD gaming and entertainment with the innovation to accelerate your performance.

**CyberPOWER Inc.**

**www.cyberpowerpc.com**

## Gamer Dragon 9000

AMD 770 Chipset Motherboard
**Genuine Windows 7 Home Premium 64 Bit Edition**
Corsair® 8GB DDR3-1600 Dual Channel Memory
1TB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD
ATI Radeon™ 5850 1GB Direct X 11 Video Card
CM Storm Sniper Gaming Case w/ See Through Window 700 Watt Power Supply
Asetek Liquid Cooling System

24X±RW
Xtreme Gear® Keyboard
16X DVD-ROM
Xtreme Gear® Optical Mouse
AMD 7.1 600 W
FREE Liquid Cooling

From **$1019**

| X4 Quad-Core Processor | | X2 Dual-Core Processor | |
|---|---|---|---|
| **AMD Phenom™ II** | | **AMD Phenom™ II** | |
| 965 CPU (Black Edition) | $ 1149 | 550 CPU | $ 1059 |
| 955 CPU | $ 1125 | **AMD Athlon™ II** | |
| 945 CPU | $ 1115 | 250 CPU | $ 1019 |
| 925 CPU | $ 1105 | | |
| **AMD Athlon™ II** | | | |
| 635 CPU | $ 1079 | | |
| 630 CPU | $ 1059 | | |

## Gamer Dragon 8000

AMD 770 Chipset Motherboard
**Genuine Windows 7 Home Premium 64 Bit Edition**
Corsair® 4GB DDR3-1600 Dual Channel Memory
1TB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD
ATI Radeon™ 5750 1GB Direct X 11 Video Card
ThermalTake Element T Tower Case w/ 600 Watt Power Supply
Asetek Liquid Cooling System

4X Blu-ray Player
Xtreme Gear® Keyboard
24X±RW
Xtreme Gear® Optical Mouse
AMD 7.1 600 W
FREE Liquid Cooling

From **$699**

| X4 Quad-Core Processor | | X2 Dual-Core Processor | |
|---|---|---|---|
| **AMD Phenom™ II** | | **AMD Phenom™ II** | |
| 965 CPU (Black Edition) | $ 845 | 550 CPU | $ 755 |
| 955 CPU | $ 825 | **AMD Athlon™ II** | |
| 945 CPU | $ 815 | 250 CPU | $ 699 |
| 925 CPU | $ 799 | | |
| **AMD Athlon™ II** | | | |
| 635 CPU | $ 779 | | |
| 630 CPU | $ 755 | | |

## Gamer Ultra 7000 Elite

AMD 770 Chipset Motherboard
**Genuine Windows 7 Home Premium 64 Bit Edition**
Corsair® 4GB DDR3-1600 Dual Channel Memory
500GB 7200RPM SATA-II 3.0Gb/s 16MB Cache Ultra Fast HD
ATI Radeon™ 5450 1GB Direct X 11 Video Card
ThermalTake V3 Mid-Tower Case w/See Through Window 420 W
Asetek Liquid Cooling System

24X±RW
Xtreme Gear® Keyboard
AMD 7.1 600 W
Xtreme Gear® Optical Mouse
FREE Liquid Cooling

From **$565**

| X4 Quad-Core Processor | | X2 Dual-Core Processor | |
|---|---|---|---|
| **AMD Phenom™ II** | | **AMD Phenom™ II** | |
| 965 CPU (Black Edition) | $ 709 | 550 CPU | $ 575 |
| 955 CPU | $ 685 | **AMD Athlon™ II** | |
| 925 CPU | $ 665 | 250 CPU | $ 575 |
| **AMD Athlon™ II** | | 240 CPU | $ 565 |
| 635 CPU | $ 639 | | |
| 630 CPU | $ 519 | | |

AMD, the AMD Arrow logo, AMD Phenom™ II, AMD Phenom™ ATI Radeon™ Graphics, 790 Series, and combinations thereof are trademarks of Advanced Micro Devices, Inc. All prices are subject to change without notice or obligation. Cyberpower is not responsible for any typographical and photographic errors. Copyright ©2008 Cyberpower. All rights reserved. NVIDIA®, nForce®, GeForce®, SLI™ are trademarks or registered trademarks of NVIDIA Corporation or its subsidiaries in the United States and other countries. CyberPower PCs use genuine Microsoft® Windows® • www.microsoft .com/piracy/howtotell

# Coming Soon To A TV Near You

## Web Video Makes The Move To Your Other Screen

Have you been watching any Web video lately? Perhaps an episode of that geeky comedy about online role-playing addicts, "The Guild"? An installment of the popular "Co-Op" games review series (revision3.com/coop)? Are you still a Rocketboom or GeekBrief.TV fan? The odds are pretty good that you watch more than a little Web video.

In just the last year, according to comScore, the number of streams viewed each month online in the United States went ballistic, from 14.8 billion in January 2009 to 33.2 billion in December 2009. After years of promises and false starts, the Web finally is making good on its long-standing promise of creating a new kind of viewing experience where thousands of programs cater to countless niche audiences and personal tastes. And it was only a matter of time before that apparently relentless hunger for a different kind of programming finally made it to the living room itself. From PCs connected to TV sets to new generations of set-top boxes and Internet-capable TVs, online video is about to migrate quickly off the desktop and into prime time. Let the living room wars begin.

### Device Support

"Pretty much all of the major consumer electronics manufacturers are coming out with Internet-enabled devices that will access video content on TVs," says Ryan Lawler, who has covered the video business for over five years for trade outlets such as GigaOm's NewTeeVee and United Business Media's Contentinople and Light Reading. "What is interesting is how they are getting the content there."

By far the most popular route now is the game console. Netflix, which has an online movie streaming service for its film rental members, recently partnered with Nintendo to bring its service to the Wii and has already become familiar on the Xbox 360 and PS3. In fact, according to a TDG Research survey of Netflix customers using the "Watch Instantly" service, about half of them are streaming these movies onto TVs. Users of TiVo and Apple TV can access millions of video podcasts as well as YouTube through their respective boxes, too.

But the routes from Web to TV are about to multiply exponentially, as will the content choices. At this year's CES, a new generation of Internet-enabled TVs was all the rage, with models from Sony, Vizio, and LG that will bring common Web services to TVs through a direct network connection. Meanwhile, the Blu-ray Disc player is poised to become yet another big entryway for Web content, as will advanced IPTV services such as Verizon's FiOS. Dedicated Web-to-TV boxes and software platforms from Vudu, Roku, and Boxee are already serving hundreds of thousands of users.

And cable and satellite providers haven't yet entered the game with any serious effort. "In three years, all of these Web services will be delivered directly to the TV or set-top box," says Lawler. Increasingly, analysts talk about the TV becoming more of a monitor on which traditional TV and new Web programming lose their old labels and just become "video" that is available on any platform. Your prime time dose of "CSI" will sit alongside the latest Webisodes of the "Red vs. Blue" machinima or Break.com's "Man in the Box."

### The Videogame-Changer

For the founders of hot, new Web-to-TV company, Boxee, it was that game-changing revelation of limitless choice on the TV that inspired their innovation. When CEO Avner Ronen first showed his friends a new $2,000 PC connected to his TV, a buddy showed him how an open-source hardware hack called XBMC (Xbox Media Center) could connect his game console to a home network of stored videos. That XBMC foundation evolved into the Boxee software program that launched in 2008.

“We have over 900,000 registered users and we added about 150,000 since the beginning of the year,” says Andrew Kippen, VP of marketing at Boxee. The interface can work on hacked Apple TVs and PCs connected to the TV. Kippen says the hack for Apple TV has been downloaded more than 100,000 times. But the standalone “Boxee Box” streaming media hardware from partner D-Link will be out this year, as well. Using an app model, Boxee has icons that link to 450 different Web services. Boxee is even tapping into time-shifted TV services online such as CBS’ TV.com. In the first 37 days of releasing an open beta of the Boxee Windows software in late 2009, the company claimed that users had already viewed more than 1.5 million movies and TV shows.

### In Need Of A New Venue

For longtime video content portals such as Blip.tv, the living room has always been the final destination. “Migrating Web TV shows to the TV set is a top priority for the company,” says co-founder Dina Kaplan. Blip.tv serves 85 million video views a month and already has a branded channel on Bravia TVs, the Roku box, Boxee, FiOS, and Tivo. “We absolutely believe that Blip.tv shows are episodic and that they are best watched sitting on a comfortable couch in the living room,” she says.

Although only 1% of Blip.tv’s video viewing currently takes place on TVs, Kaplan says early evidence suggests that the TV set environment fundamentally changes how people use Web video and helps the struggling streaming media marketplace overcome some of its longstanding problems. On the desktop, typical viewing times are only between three and four minutes. And despite repeated attempts by major distributors such as MySpace and AOL to build return audiences for Web video shows, the Internet has proven to be a very tough place to build an entertainment brand and viewer loyalty.

“There is a fallacy on the Web world that you need to just produce your content and then magically through some Internet fairy dust it will spread and millions of people will see it,” says Kaplan. Web video viewing is so fragmented and brief that initial enthusiasm for new video programming often wanes by episodes three or four. On the TV, viewers are consuming that same content—several episodes at a time and potentially with greater loyalty. “We noticed that the average length of time people watched a video [on TV] was five times higher than it would be on the Web,” says Kaplan. “It becomes more like a relationship you have with a TV show.”

## Roku’s Cheap & Easy Web TV

One of the early entrants into the Web-to-TV hardware wars was also among the most reasonably priced. Wi-Fi/network-enabled Roku boxes run from $80 for standard-def to $130 for HD and 802.11n connectivity. In addition to Netflix and MLB.com, the 17+ channels include access to Amazon.com’s video download service, Pandora music, and the respective Web video programming of Blip.tv and Revision3 (revision3.com). With 500,000 boxes already installed, company VP of Business Development Jim Funk tells us that innovative low-cost technology and highly valued content are the secrets to their success.

**CPU:** Streaming media boxes have come and gone for years. What is the hardest technical trick about making them consumer-ready?
**Funk:** “The end trick is how to make it easy and indistinguishable from watching a DVD or TV. Obviously, consumers need to have sufficient bandwidth. But we need to have video that is encoded at high enough quality. In the end, it comes down to software in the box that masks a lot of the imperfections in the system. We have to maintain a high-quality video experience even though we [have to send content over] unreliable [home and Wi-Fi] networks. We have to make it super simple to set up. A lot of what we do is try to hide a lot of the complexity and not necessarily invent new technologies for encoding.

**CPU:** What is different about Roku from previous media streaming solutions?
**Funk:** A lot of devices prior to Roku relied on a hard drive to buffer video, so you had to start the download and store to disk before watching. Our architecture buffers some in memory, but you start to watch almost immediately. It allowed us to do a much more affordable product that didn’t need a hard drive. We do this by detecting your network bandwidth and choosing a stream that’s appropriate. The partners can encode at various data rates. If [bit rate] doesn’t keep up we can shift streams.

**CPU:** How do you handle fast-forwarding and rewinding?
**Funk:** We thumbnail the file so you can look through them DVR-style and fast-forward or rewind without having the whole file stored on a hard drive.

**CPU:** You just released an SDK for developers, and Roku uses a kind of widget or app interface for its channels. Why are you using this format?
**Funk:** TV interfaces are challenging because you have a simple input device–no mouse or keyboard. You need large images and a very graphical interface with relatively simple interactions. So we have separate content channels for each partner, which can be music, video, or photos, and fairly consistent navigation. Some of these widgets may be more flexible in how the user interacts. But one thing we are not trying to do is applications on top of video. There is not much need to overlay more Web on top of video. We focus on what is the simplest way for users to find interesting video and sit back and enjoy it.

Not only will Web video change TV viewing, but the TV is bound to change Web video as we know it, says Will Richmond, editor of trade publication VideoNuze. “I think short-form video flourished on the Web because sitting up straight in a chair two feet from a monitor is not a comfortable position. Short-form video is easily shared, as well.” It is remarkable enough that billions of streams actually are viewed this way each month. “Imagine what’s ahead when consumption is just as easy on a TV. There will be a serious knee in the curve of mass adoption,” Richmond says. But there will also be a transformation of the video itself. “There is every reason to believe that viewership patterns will emulate what we have seen on TV, and longer forms will become more prevalent.”

## Getting The Picture

For early adopters of Web-to-TV video, it’s thrilling to lean back and watch their favorite Web series on the big screen, but the technical and business hurdles to building a seamless merger of the two platforms remain. Obviously, every consumer electronics manufacturer wants a piece of the Web video craze, so the field is already cluttered with TV, set-top, and disc player options. For content providers such as Blip.tv, “the biggest challenge is that each platform has its own way of doing things,” says Blip.tv CTO Justin Day. Thankfully, just about everyone has settled on using the H.264/MPEG-4 video compression codec for bringing video to TV. But beyond that, Day and his team have to write custom widgets and interfaces for all of the boxes and TV services they support. There is no ubiquitous platform, such as Adobe Flash, on TVs. Every box has its own proprietary system and separate SDKs.

“It is similar to the early days of Web video,” says Day. “The absence of a standard platform makes it difficult to dynamically feed the preroll advertising that currently funds Web video or the analytics tools that make digital media so much more measurable than TV. Adobe Flash, Microsoft Silverlight, Apple QuickTime, and DivX, and others are likely to compete just as ferociously to dominate this screen as they did with the desktop.

With over half a million in-market, the Roku box was one of the first and least expensive Web-to-TV streaming media devices to gain traction in the market.

“It is going to be messy for some time to come,” says Richmond, “but . . . in three to five years, every new TV will ship not only with an Internet connection but with Wi-Fi.”

Shaking out a common interface for navigating so many choices and discovering video will be another messy affair. The next generation of remote control may require a QWERTY keypad of some kind because it is a special kind of torture to enter search terms via a current remote. Boxee already uses social networking as a way for friends to share their favorite videos with each other, and most analysts expect Internet-enabled devices to develop personalization tools and recommendation engines that help users find the right content amidst the limitless possibilities coming to the living room.

“We would like to see you discover new things through friends, tastemakers, celebrities, or experts,” says Kippen. “If you want to share something, it should go out on Boxee, Twitter, and Facebook, and on an open API so you can interact with all of those services.”

The “Boxee Box,” made in partnership with networking hardware maker D-Link, is promising to bring over 450 channels of Web video directly to TV screens this year.

This wholesale blending of Web and TV service is not without controversy and some angst to traditional TV providers. Although many consumers love the blending of Internet and TV, the big networks and cable companies see their living room monopoly eroding. Comcast, Time Warner, and others are responding to the rise of Web video by launching “TV everywhere” projects that push their longer-form programming onto the Web and mobile devices. TV-on-demand platform Hulu refused to allow Boxee to carry the service because it wants to control where, how, and at what cost viewers can access recent episodes on their TV.

“We are in constant contact with [TV networks],” says Boxee’s Kippen. “We tell them we are a place to experiment, a sandbox. But there’s a big emotional component to what they are doing. A lot of business models are changing, and a lot of contracts are being rewritten as the Internet becomes a bigger platform for entertainment.”

The model that is changing fastest, however, is consumers demanding a wider range of content when, where, and how they want it. Web video opened everyone’s eyes to the possibilities of limitless channels that make even the most advanced digital cable boxes seem stingy. The genie is already out of the lamp, says Lawler.

“The democratization of Web video is just going to increase the choices people have and make broadcast TV even less relevant.” The living room war has just begun. ▲

**by Steve Smith**

# VERTEX

## *Limited Edition*

## SOLID STATE DRIVE

- **Exclusive High-Performance Controller**
- **MLC Memory**
- **TRIM Support**
- **Ideal for Windows**
- **Maximum Performance:**
  - **Read Up to 270MB/s**
  - **Write Up to 250MB/s**
- **Available in 100GB and 200GB**

**OCZ's latest ground-breaking solid state drive is taking shape in a limited edition solution. Pushing the envelope like never before, the OCZ Vertex Limited Edition surpasses the competition where it counts most—performance. Still the Vertex LE series doesn't lose sight of what makes an SSD the ideal storage alternative to hard drives and delivers the quality, reliability, and durability demanded by consumers that won't settle for anything but the best. Complete with TRIM support, Vertex LE is the ultimate Windows 7 system upgrade.**

OCZ
Technology
ocztechnology.com

Available at:

amazon.com
Buy.com The Internet Superstore
D&H
MICRO CENTER The Ultimate Computer Store
NCIX.COM Great Technology, Selection & Service
newegg.com
TigerDirect.com

amazon.com buy.com dandh.com microcenter.com ncix.com newegg.com tigerdirect.com

# The Department Of Stuff

by Rob “CmdrTaco” Malda

# backward.txt

The Internet is moving backward. The rise of the Apple App Store and the recent announcement of the iPad demonstrate a transition toward the proprietary. These events signal a shift away from the standards that made the Internet successful in the first place. It appears that we are witnessing some sort of transition from a teenage Internet to an adult, the idealism of youth giving way to the practicality of adulthood. And it remains to be seen if it is for the best.

*Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the ’Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.*

You rely on standards every day. Your email is sent through SMTP. Your Web pages are served through HTTP and are written in HTML. Even the name.coms that you type daily into your address bar are built upon another ancient standard known as DNS. These standards were vetted by many engineers with unique motivations and employers, but they were open: Everyone was welcome to build clients and servers that adhered to them. This great standardization is the single most important reason that the Internet exploded in the ’90s, graduating from a childhood useful only to academia to a tool useful to your mom.

These standards extend down into your computer to varying depths. Open-source operating systems such as Linux take them down to the very bottom depths of your CPU; Windows and Mac OS take them down to APIs used by application developers to create the tools you use. The application developers ultimately make each system useful by writing Web browsers and email clients and checkbook programs that you actually use when you “compute.”

In the last few years, the Apple App Store has risen to prominence. Millions of iPhones and over 140,000 apps make it a very powerful but proprietary platform; Apple can control the innovation. The company can restrict whatever it likes, for whatever reason. Google Voice can’t exist because Apple says so. BitTorrent? Well, AT&T wouldn’t allow that to happen, so all users are limited. Because Apple refuses to provide true multitasking, it’s effectively impossible to run a huge class of apps on the phone.

But these are all useful technologies that rose to prominence because people wanted them and because corporations didn’t have a veto over what an innovative programmer wrote. Of course Apple and AT&T want to restrict Skype or Google Voice, as it restricts their control or consumes more bandwidth. The glory of the Internet used to be that billion-dollar corporations didn’t get to dictate what we could and couldn’t do.

The ongoing efforts to jailbreak iPhones continue to demonstrate that there is a strong desire on the fringe of the computing world to do things with the device that Apple just won’t allow. Some of these are questionably legal, but others are completely legitimate uses of hardware owned by an individual. After all, you paid for it. You should be able to use it however you desire.

With the iPad, Apple has taken another step toward the proprietary and away from the standards that made the Internet catch on just a few years ago. The logical extension of this is a divided Internet: one for Apple, another for Microsoft, and perhaps another for old-school idealists, forever relegated to the ghetto of computing. Your bank’s Web site wouldn’t support an open-source browser such as Firefox out of altruism: It’s only because the Web is built upon standards that you even have a choice in Web browsers.

Moving forward, developers will be required to create their software for more and more unique platforms. In the ’90s, you might have needed to support just Mac and PC. Through the last decade, you may have needed to support Netscape and IE. But in the next decade, we may be forced to support iPhone, Windows, Android, Mac OS, Linux, and so on. This would place a huge burden on developers, potentially leading to a point where only the top few platforms will have truly mature applications.

You can bet that those platforms will be highly restricted by their corporate overlords, and computing as a whole will suffer. And it only gets worse; the more restricted the Internet’s tubes become, the less freedom we will have. The worst-case scenario is nothing less than the complete loss of free speech on the Internet. When all the on-ramps are controlled by mega-corporations dueling for market share, we all lose. ▲

---

**Contact me at malda@cpumag.com**

Yeah, we know you have blogs to post, video to encode, reports to write, and code to compile. We do, too, but you have to take a break once in a while (and maybe blow some stuff up). That's why each month we give you the lowdown on what to expect from the latest interesting PC and console games.

CPU
Game Of The Month

# MASS EFFECT 2

## Epic Galactic Adventure – *by Dr. Malaprop*

We enjoyed 2007's Mass Effect by Bioware for the Xbox 360 and PC (see our *CPU* reviews in February 2008 and August 2008, respectively). The great storytelling, graphics, and action-RPG combination culminated, depending on the choices you made, with one of several endings. Your Commander Shepard character could be male or female and customized to look different than the default character.

As you get started in Mass Effect 2, you can either import your Shepard character from the original Mass Effect or create a new one. As the game progresses, you're rewarded with ample cues of how your decision in the last game continues in the world of Mass Effect 2. There's no requirement to complete the original game, but you'll have a more enjoyable experience if you do.

Cerberus, the controversial pro-human organization from the first game, brings you into its fold. The shadowy Illusive Man who leads Cerberus is in need of the great Commander Shepard because an alien race known as the Collectors are stealing entire colonies of humans without a trace. Tracking the root cause has proven unsuccessful thus far, and Cerberus wants answers.

Take time to replay some segments of the original Mass Effect, and you'll find the sequel not only features markedly better visuals, but also addresses all the criticism leveled at the original. For example, thanks to a shuttle drop-off at mission locations, you're no longer relegated to wincing through driving the Mako to missions after you land on a planet. The time-consuming inventory system has streamlined and all but vanished in the new version. There's not much loot, but you'll discover technologies, which you can then research and build back on the Normandy. As before, your decisions in dialogues and in-game choices propel the narrative. Your moral leanings (Paragon or Renegade) based on your choices will lead you toward new conversation options and "interrupts," where you can let actions speak louder than words.

Shortcomings include some of the repetitious minigames based on gathering minerals from planets (to gather resources for research) and hacking terminals or doors. Repetitive as they were, the minigames appealed to our OCD sensibilities, so we'd go out of our way to play them. We also missed how the various armor and weapons were visually represented on characters, because in Mass Effect 2, Shepard and the team armor/weapon upgrades feel more akin to skinning characters.

Graphically, the PC easily takes the lead, but you'll want to hit the 360 version for Achievement Points. The third-person action view now feels much tighter and incorporates improved cover mechanics. There's a better cast of characters, strong voice work, great effects, and an intriguing narrative that glues it all together. Action elements are where your health and shields automatically regenerate, and Medigels are used primarily to revive teammates. The game feels darker, and the core game focuses on Shepard gathering a largely familiar and very welcome team. After you've recruited them, you'll want to build loyalty by chatting with and supporting the characters. Along the way, you'll become very familiar with teammates and find yourself genuinely concerned for their well-being, knowing as you approach the endgame that whether they live or die will be critical for the character roster of Mass Effect 3.

Mass Effect 2 provides a palpable feeling of excellence that pulls you in like a good book or movie and leaves you wanting more, even after a 30-plus-hour play-through. You'll want to do it all over again in a completely different way, because it's just that much fun. ▲

$59.99 (X360); $49.99 (PC) • ESRB: (M)ature
Electronic Arts • masseffect.bioware.com

# BIOSHOCK 2

$59.99 (X360, PS3); $49.99 (PC) • ESRB: (M)ature

2K Games • www.bioshock2game.com

## Welcome Back To Rapture – *by Chris Trumble*

In BioShock 2, you take on the role of a Big Daddy, one of the hulking, armored guardians designed to protect the Adam-gathering Little Sisters. Your story begins before Rapture's hellish descent into full-on madness (so before the events of BioShock, CPU's Game of the Year for 2007)—but only just. Your Little Sister is torn away from you as her mother uses plasmids to destroy you, then leaves you for dead.

Flash forward 10 years; you awaken somehow to find yourself in a very different Rapture. Andrew Ryan's war with Fontaine is long over, but a new power-hungry lunatic is running things, and guess what? It's your Little Sister's biological mother, a psychiatrist named Sofia Lamb. The original Little Sisters have grown up and have become (naturally) Big Sisters. Yours, a girl named Eleanor, needs your help, and you need to find her before you die (again).

BS2 manages to retain all of the considerable atmosphere and creepy charm of its predecessor, not to mention its core gameplay elements, while benefitting from substantial improvements. The game's graphics are vastly better, and, perhaps more importantly, 2K revamped the combat system, giving you the ability to use plasmid powers and weapons simultaneously. The new hacking system is also a huge upgrade; no more rerouting a jumble of tubes to take control of machines—in BS2, you'll hack them by virtue of your reflexes, and the new hacking tool lets you control machines from afar, which is especially nice in the case of security cameras and the like. Also, BS2 adds a very cool multiplayer mode that lets you see Rapture before everything went south. You'll gain levels, upgrade your weapons, and get access to new plasmids as you play.

In short, BioShock 2 missed being Game of the Month by the slimmest of margins; it's outstanding and provides a welcome return to one of our favorite game worlds of all time. ▲

---

# DARKSIDERS™

## Horsemen Of The Apocalypse – *by Dr. Malaprop*

$59.99 (X360, PS3)

ESRB: (M)ature

THQ

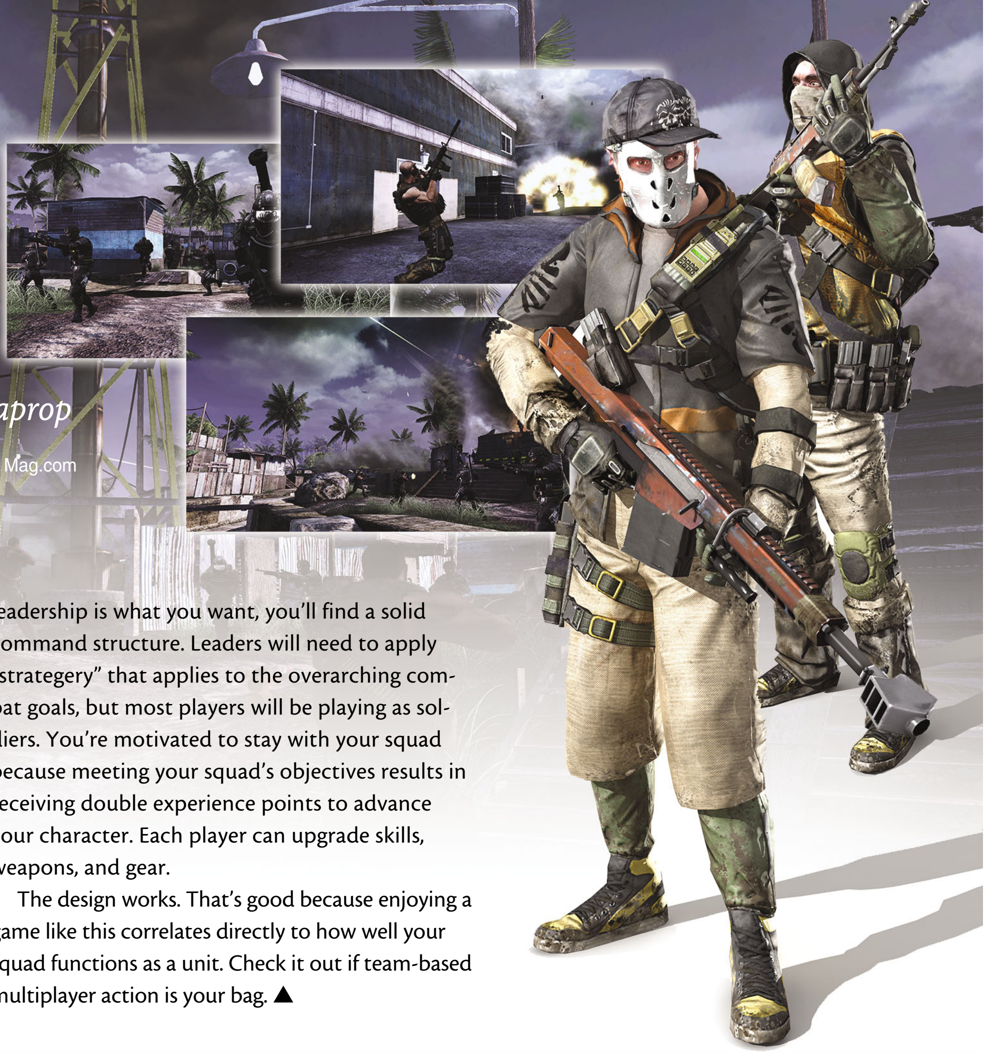
darksiders.com

As War, one of the famed four horsemen, you enter the game during the eve of the Apocalypse. Unfortunately, the other three horsemen are no-shows, and the imbalance of heaven and hell is blamed on War. You awaken after the passing of nearly a century and are tasked to reset the cosmic balance. Along the way, you uncover the conspiracy that led to the original apocalyptic catastrophe.

We'd be the first to admit that Darksiders' storyline leaves much to be desired considering that we just completed Mass Effect 2. Fortunately for Darksiders, its action-adventure gameplay combines elements of some of yesteryear's best games. Anyone with a history of playing games will recognize the heavy influences developer Vigil Games got from the likes of The Legend Of Zelda in world design, Panzer Dragoon's flight, Prince Of Persia in platforming, God Of War in combat, and others. The seamless blend of these influences makes Darksiders feel fresh even though it's an imitation. What counts is having a good time, and Darksiders delivers.

Gameplay is linear. You spend much of your time bashing all manner of enemies, and each level culminates in massive boss battles. As you travel through the world exploring, you encounter logical puzzles that fit the gameplay. Weapons work into the mix by providing you with new tools to unlock puzzles and advance the game. However, we were displeased with having to backtrack to collect items near the endgame. ▲

# MAG™



## An Army Of Many – *by Dr. Malaprop*

$59.99 (PS3) • ESRB: (T)een • Sony Computer Entertainment • Mag.com

MAG is a massively multiplayer military FPS action game that omits single-player campaigns and AI bots. This is about playing with real people against real people on huge maps. You'll join one of three factions as you begin the game and can't switch until you reach Level 60. MAG limits players to only a single character per PSN account, which creates strong kinship with your faction.

The game supports up to 256 players, but you'll be limited to 64-player maps until you hit Level 8. The first eight levels are essentially training grounds for new players. At Level 15, you'll have the opportunity to take on leadership roles. If leadership is what you want, you'll find a solid command structure. Leaders will need to apply "strategery" that applies to the overarching combat goals, but most players will be playing as soldiers. You're motivated to stay with your squad because meeting your squad's objectives results in receiving double experience points to advance your character. Each player can upgrade skills, weapons, and gear.

The design works. That's good because enjoying a game like this correlates directly to how well your squad functions as a unit. Check it out if team-based multiplayer action is your bag. ▲

# THE SABOTEUR

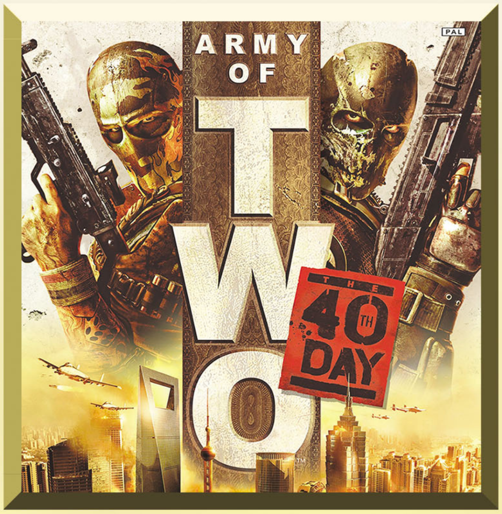
## Flawed But Fun – *by Dr. Malaprop*

Irishman Sean Devlin is a mechanic-turned-racecar driver mourning the death of a close friend in Nazi-occupied Paris. The story is told in a series of flashbacks, but the pity party doesn't last long. Sean joins the resistance and takes to snuffing Nazis left and right.

Open-world Paris and its nearby towns and countryside are the setting around which missions utilizing sneak, shoot, and drive mechanics typically end in combat-heavy sequences. These span the storyline and side missions. Sneak up on and kill a Nazi without anyone seeing you, and you'll be able to don a disguise to slip past enemies. Your in-game behavior creates opportunities for Sean to gain perks that increase his skillsets, such as driving, explosives, and so forth.

Plus points for the stylized way the game's predominantly black-and-white graphics become colorized as you complete missions. We liked that you could typically tackle objectives in one of many ways. However, the AI is lackluster, and the game clearly would have benefited from delaying the release to add polish. In spite of that, the colorful storyline, giant explosions, and core combat left us entertained. ▲

$59.99 (X360, PS3); $49.99 (PC) • ESRB: (M)ature • Electronic Arts • pandemicstudios.com/thesaboteur

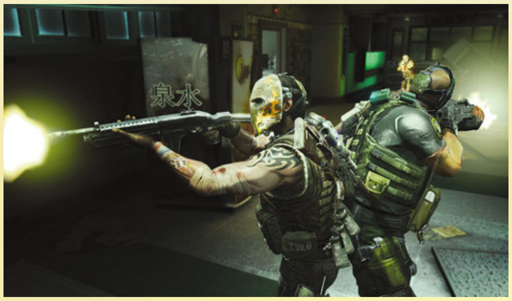


$59.99 (X360, PS3) • ESRB: (M)ature

Electronic Arts • armyoftwo.com

## Co-Op Hijinx – *by Dr. Malaprop*

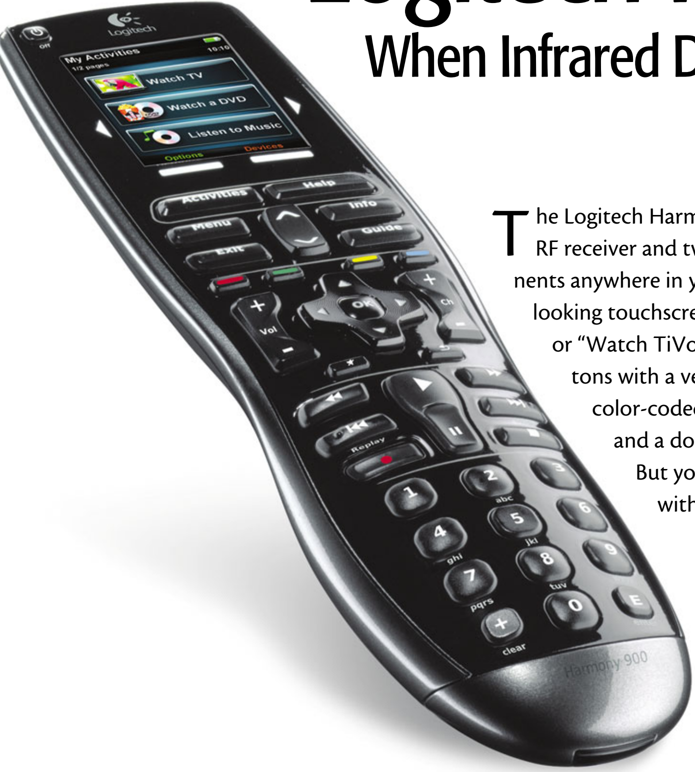
We previously reviewed Army Of Two in the June 2008 issue of *CPU*. Its sequel, The 40th Day, is more of the same but with improvements. You are back in the shoes of either Salem or Rios, but this time in Shanghai for what seems to be a simple job. (Hint: It isn't.)



Split-screen or online co-op support lets you and a friend complete the game together, but otherwise the AI does a good job of keeping up in single-player. As a team, Salem and Rios help each other navigate the environment, flank enemies, and even surrender. We liked surrendering to distract the enemy while our cohort scouted around and took them out from behind. Furthermore, you can also take hostages, and higher-ranking guards will keep junior officers at bay. Morality and weapons customization are other new features. The 40th Day felt very similar to the original, and if you liked the original Army Of Two, you'll enjoy this. ▲

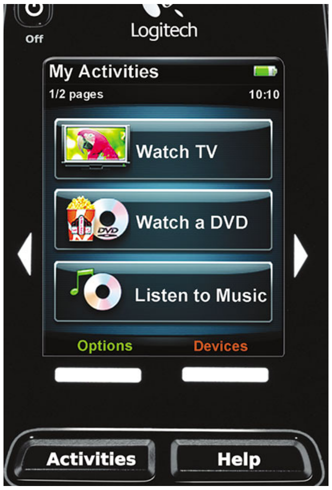
# Logitech Harmony 900

## When Infrared Doesn't Do The Trick



The Logitech Harmony 900 includes RF support with a powered RF receiver and two RF-to-IR emitters for those hidden components anywhere in your home theater/game room. The sharper-looking touchscreen used for setup and Activities (i.e., "Play 360" or "Watch TiVo"), easy PC-based configuration, backlit buttons with a very nice tactile feel (including new Blu-ray color-coded buttons), removable rechargeable battery, and a docking station combine to make a solid package. But you'll still need an additional $60 to use the 900 with your PS3.

Also, consider the Harmony One Advanced Universal Remote ($249.99; reviewed in the April 2008 CPU) to save money if RF isn't a requirement. The 900 is expensive—especially considering its lack of support for programmable macros—but it's the closest to perfection we've seen yet for a universal consumer remote. ▲



$399.99 (Windows, Mac)

CPU Rating: ●●●●◐

Logitech

logitech.com

# HADES Crafted Series

Three Temperature Display for your CPU, GPU and System

High Performance Fans

Premium Sleeved Cables

## Limitless Imagination.

Hades, a chassis that provides an array of advanced features for the most demanding PC enthusiast. Airflow is optimized with 5 fans(dual 200mm intake, 200 mm front fan, dual top 140mm fans, side 200mm fan, and rear 120mm exhaust). NZXT includes all the fans with the exception of the top 140mm and also provides a dual fan 8W per channel controller giving enthusiasts freedom to manage intake and exhaust airflow. A three temperature display on the front panel allows the user to see the temperature inside the chassis.

**NZXT.™**
**CRAFTED GAMING ARMOR.**
www.nzxt.com

newegg.com TigerDirect.com amazon.com Fry's Electronics MICRO CENTER The Ultimate Computer Store ZipZoomfly.com iBUYPOWER CYBERPOWER NCIX.com Canada Computers ASI by Barry Brenesal

# The Rise Of VisiCalc

When you say "spreadsheet" today, most people think "Excel." The two weren't always synonymous, though. Quattro Pro was once very popular (and deservedly so), as was Lotus 1-2-3 before it. Back in the dawn of DOS stood VisiCalc, which few computer users have even heard of these days, yet it was arguably the most important piece of software ever released for the personal computer.

A few different stories have circulated about how Dan Bricklin came up with the idea for VisiCalc. He may have had a brainstorm at Harvard Business School while watching a professor redo blackboard entries on a financial model, or perhaps he daydreamed about a video screen, a mouse, and number-crunching rules. Suffice it to say, in 1978 he conceived of the first computerized spreadsheet program.

Bricklin prototyped the design that fall on an Apple II that he borrowed from Dan Fylstra, the man who would soon become his publisher. (Fylstra had purchased the Apple II from Steve Jobs at a considerable discount.) Along the way, a lot of other content fed into the main concept, with increased functionality and user accessibility at the top of the list. Bricklin and Bob Frankston, who did the actual coding, agreed to produce the program for Flytrap's Personal Software, but it was clear this computerized spreadsheet (termed "Calcu-ledger" originally by Bricklin; Frankston suggested "VisiCalc" after "visible calculator") was something new with a big future. The royalty rate agreed to by Bricklin and Frankston was the unusually high 37.5%. By the end of VisiCalc's existence, the pair had made more than $12 million in royalties, though Fylstra's own company had done better, still. In other words, no one lost on the deal.

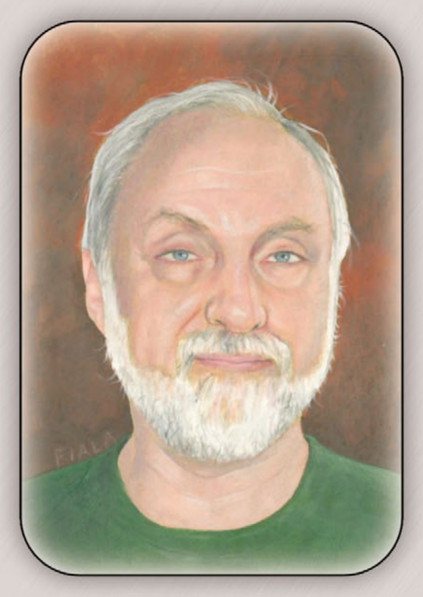
Bricklin immediately had a chance to put his new software to the test in an Advertising class assignment about the Pepsi Challenge campaign. He had some problems with this, according to the developer, as the early, prelive VisiCalc couldn't print—so he had to copy the results by hand—and couldn't even save, meaning that when it crashed, he had to enter everything, again. The results were worth it, however. His professor was pleased with the sophisticated level of presentation, having no idea that it had been accomplished with the prominent aid of software.

VisiCalc was first revealed to the press in May 1979 and publicly announced in June. Frankston delivered a paper at the National Computer Conference, which went largely unnoticed, while *The New York Times* mentioned them only in passing during a silly article that likened computer users to frenzied sect worshippers, and VisiCalc to a new god in the pantheon. It would have been more sensible to abandon the attitude filter and actually listen, because this was the first computer product to demonstrate strong cross-market applicability: suitable for bookkeeping departments, homework, personal finance tracking, and scientific use. VisiCalc was the archetype of the program that everyone finds some use for.

The first version shipped for the Apple II later that summer. Long before the end of the year, it was clear that Software Arts, as the company Bricklin and Frankston founded was named, had created something big. Or, as Bricklin himself put it wryly, "Any product that pays for itself in two weeks is a surefire winner." They moved to larger quarters and created VisiCalc ports for a range of popular computers of the day, including the TRS-80 Model II and the Atari 800. Software Arts was commendably quick in responding to IBM's introduction of the PC in 1981. Its new PC-based version of the spreadsheet was only 27K in size and supported up to 512K RAM. Revenues were obligingly strong throughout 1982 at a steady $5 million to $6 million per quarter, hitting over $9 million for the first quarter of 1983.

Apple's co-founder Steve Wozniak commented in subsequent years that there were two factors leading to his company's success: its floppy disk drive and VisiCalc. This is exaggeration for effect, but it does correctly emphasize how many people with different interests found a common need in VisiCalc. It was proof to everyone that the personal computer was more than just a geek's hotrod.

Next month, the clouds gather as we turn to The Fall Of VisiCalc. ▲



*Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100. It was last seen functioning as a boat anchor.*

**Wax nostalgic with Barry at barry@cpumag.com**

# Software Tips & Projects

## Windows Multimedia DVD Creation On The Cheap

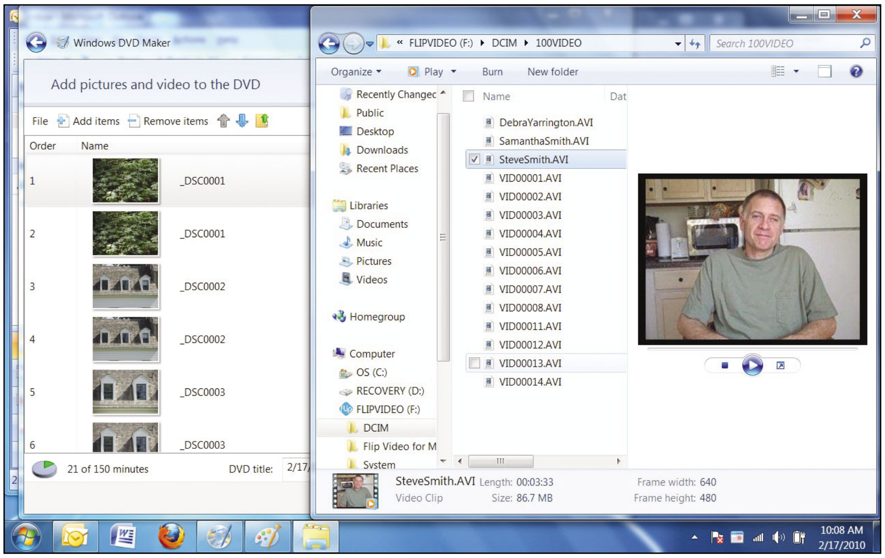
As longtime "Software Tips & Projects" readers know, Microsoft has a number of underused programs for making and managing personal media. From Photo Story slideshow to Movie Maker, the programmers in Redmond continue to churn out tools that make amateur but polished multimedia production easy and, better still, cheap. This month and next month we look at some of these tools that have survived into Windows 7 and also have been recently upgraded to coincide with the release of the OS.

### Your 10-Minute Multimedia DVD Project

Stop fishing around your pile of old media maker suites whenever you feel the need to burn a DVD. Starting with Vista, the quickest route to making a DVD is the oft-overlooked DVD Maker. It remains in Win7 unchanged. In November 2007 we took a quick look at DVD Maker (see page 96), but here is an even cooler use of the simple tool to blend video from a camcorder and images from your photo library into a single playable disc.

In the Vista or Win7 Start Search box, type **DVD Maker** to surface the program. The undiscovered beauty of DVD Maker is that it is not only the quickest way to make DVDs straight from a portable capture device such as a Flip camcorder, but it can also pull images into a DVD slideshow on the same disc.

Open DVD Maker. We used the Flip camcorder as an example of pulling media straight from a device into the DVD Maker. When the Windows PC recognizes the Flip, ignore the options to import Flip software or the video themselves and just select Open Folder To View Files. The folder name holding your video may vary by device type; in our case, we drilled into DCIM\100VIDEO to find the AVI video files we had created. To make the process even easier, the Windows Explorer folder lets you preview your video in a Preview Pane when you highlight an AVI file. If this pane isn't activated, use the Organize drop-down menu to find the Layout submenu and check the Preview Pane option.



**Windows' DVD Maker will let you drag and drop raw video directly into the simple disc editor/burner so that you can go from camcorder to DVD in no time.**

Now, we simply dragged and dropped the video files from the Flip into DVD Maker's main screen. You can even highlight multiple video files from the Flip and press and hold the CTRL key to drag the group over to the DVD Maker. Then, drag and drop any of the clips up or down to change the order in which you want them to play. Click the Options link in the lower-right corner of the program. Here you can change the format to widescreen and determine how the DVD will play when inserted into a player.

One caveat to using DVD Maker with an attached device like the Flip: The device must remain connected to the PC throughout the editing and encoding process. DVD Maker will only pull the files off of the connected device when it encodes the project before burning.

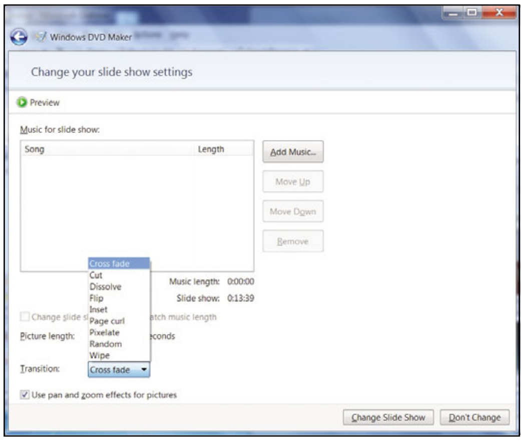
### Media Mixing

But the coolest thing about the DVD Maker is that it isn't just for video. You can also make a basic slideshow of your image library and even include it on the same DVD project as your video clips. Starting with the DVD Maker project with the video clips we pulled directly from our Flip, we simply opened our Pictures library in a separate window. We can drag and drop individual images into the DVD Maker window or add entire folders. The downside is that DVD Maker dumps all of the imported images into a single "Slide show" folder, so there's no opportunity to create separate themed shows. Still, you can drill into the slideshow folder now on your DVD Maker list and reorder or remove any of the images.

You'll notice in the file list that your slideshow folder has a duration value attached to it. DVD Maker actually renders your images into an autorunning stream of pictures and will even apply zoom and scan effects and a basic set of transition styles. At the bottom of DVD Maker, a pie chart shows what percentage of the DVD project the videos and images now occupy. In a later screen you can change the slide duration.

Click Next to get to the customization options that precede the DVD burn. We won't belabor the menu style options, as they are fairly obvious if you tap into the Customize menu. Here you can play with different videos that run with the DVD menu screen, change titles and labels, and choose among different formats for the chapter navigation. Use the Preview button to see how the different options will play.

We are concerned here with the Slide Show button. In this option window you can set the picture length (using, appropriately, Picture Length) to increments between three and 30 seconds. There is also a Transition drop-down menu that imposes one of nine common ways of advancing to the next image (wipe, fade, etc.). Finally, you should also decide if you want DVD Maker to impose its own zoom and scan effects. Sometimes called the "Ken Burns" effect, this animates your slides by panning and zooming in and out of the images as they appear. It isn't always attractive, so we again recommend you use the Preview button. In the main menu of the DVD, click Scenes. The videos in the project will run as animated thumbnails, but the thumbnail button for your slides will be the first static image in your collection. Click this thumbnail to preview how the duration length and effects will appear in the final product.



Change your slide show settings

Music for slide show:

Music length: 0:00:00

Slide show: 0:13:39

Transition: Cross fade

☑ Use pan and zoom effects for pictures

DVD Maker also will render your still images into an animated slideshow with background music and basic transition effects.

Also notice in your slideshow settings window the opportunity to import music. You can pull in one or more files in the MP3/MP2/WAV/WMA formats. Below the music list, DVD Maker will show you the duration of the music compared to the duration of your slideshow. You can add music to fill the desired slideshow length or extend the Picture Length setting so the two duration times are close. Once the music length is close to the slideshow's duration, try checking the Change Slide Show Length To Match Music Length box. This will tweak the Picture Length so the music ends in synch with the slides.

You should be ready to burn the project to disc. Expect a long process even with fast processors and loads of memory. ▲

**by Steve Smith**

### Windows Tip Of The Month

This month's Windows Tip, along with the Registry Tip, concerns the new Windows Live Movie Maker update available to both Vista and Windows 7 users. Go to download.live.com/moviemaker and use the Download button to install and load the Live Installer software. You'll be offered the options of downloading nine new versions of familiar Windows tools, including Messenger, Mail, Photo Gallery, and more. For our purposes, just download Movie Maker. Even veterans of the old WMM program will be surprised at the depth of the revisions here, including a new ribbon interface, quick uploading to YouTube, and rendering in 1080p. Next month we will be using WLMM, so get acquainted now.

### Registry Tip Of The Month

Windows Live Movie Maker lets you pull images, video, and audio from your PC, but it refuses to pull in media from your network. When a user tries to import media over a network, Microsoft simply suggests that you copy the file first to your local PC and then import it into MM. But many of us keep our media on networked servers and hard drives, so Microsoft's approach adds another step and unnecessary copies of large files. There is a fix that lets you import files directly from the network. Open the Registry Editor. Go to the key HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS LIVE\MOVIE MAKER. Right-click this sub-key, click New and then DWORD (32-bit) to add a new Value to the right-hand pane. Name this new item "AllowNetworkFiles." Double-click on the Value and change the Value Name from the default "0" to "1." The effect is immediate, but you need to restart Movie Maker.

## Infinite Loop

### Tufts Turns To YouTube

You know, as in Tufts University? That's right, the Massachusetts university has decided to let applicants complement their applications with brief YouTube videos. Worried about that D+ in AP Biology? Afraid that 470 SAT Verbal isn't going to cut it? Stop fretting, because that 30-second clip of you showcasing your beatboxing skills is totally going to put you over the top! Of course, realize you'll be facing some stiff competition from Keyboard Cat, lonelygirl15, and the Numa Numa guy.

*Source: www.nytimes.com/2010/02/23/education/23tufts.html?hp*

ARE YOU READY FOR THE BATTLE?
[MAELSTROM MILITARY VERSION]
01
[IRC-F1001 MILITARY CAMO]
[FANQUA]
[AMMO]
IN WIN

IN WINNING FASHION since 1986

Award winning manufacturer of professional computer chassis, power supplies and digital storage devices. Contemporary & Innovative

IN WIN www.inwin-style.com

D&H newegg.com SuperBiiz Bestbyte Canada Computers CyberPower Inc.

# Warm Up To Penguins

## Multimedia According To Linux

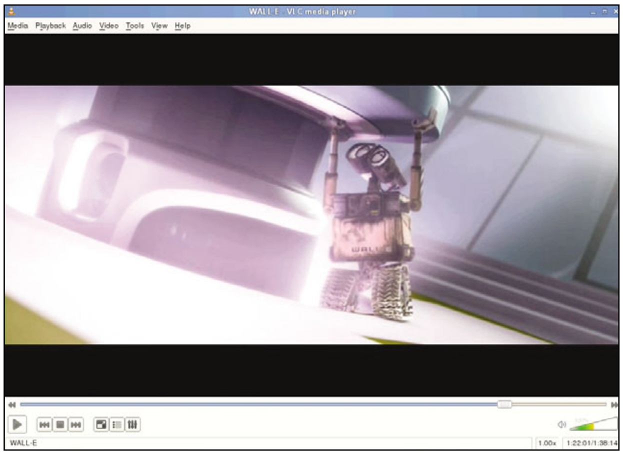
Whether it's some home movies, DVDs you've bought, or a funny commercial you've just downloaded, chances are you have a vast collection of multimedia "stuff." And although Windows comes with Windows Media Player and Mac includes QuickTime, Linux doesn't have a universal media player. On one hand, this makes it a tad difficult in having a media player that can play every file format. After all, if there were a media player common to all Linux flavors, everybody could focus on making it work with the broadest possible range of formats.

On the other hand, because each Linux distribution can have its own media player, you also have a lot of variety. You're not "stuck" with a media player that doesn't support a particular file format. Just load up on media players and use the player that suits your fancy. What's even better is that some media players are actually media conversion programs that happen to do multimedia playback.

### History Of Multimedia On Linux

The algorithm and programming needed to encode and decode multimedia files is known as a codec. Because Linux traces its roots back to Unix—primarily a text-only platform—handling multimedia codecs was largely ignored. Add to that the fact that some of the multimedia file formats used on Windows or Mac allow for custom codecs within their files so that it's possible to have a multimedia file that's playable only on one platform, and in some cases only on a handful of machines. But, naturally, as more and more people started using Linux, the demand for end-user applications has increased.

Through the years, a number of development groups formed to handle the different multimedia files. Most notably, GStreamer (www.gstreamer.net) and libavcodec (ffmpeg.org) are the most popular libraries used by other open-source projects to handle multimedia files. GStreamer uses a plug-in architecture that allows for arbitrary file format support, while libavcodec offers a more traditional programming library interface for managing multimedia files. There is also a plug-in available for GStreamer that is based on FFmpeg, which in turn is based on libavcodec.



VLC can play media files that are broken, incomplete, or still downloading.

These differences between GStreamer's and libavcodec's underlying structures have also led them into comparably different markets. Many open-source applications that do multimedia playback or let you modify those files have gravitated toward libavcodec. It's used in such a wide variety of applications like the video-editing suite Cinelerra, the multimedia player xine, and the audio editor Audacity. Meanwhile, GStreamer has found wider acceptance on specialized Linux platforms. The Palm Pre and some Linux-based Nokia tablets and smartphones use GStreamer as the base for their multimedia playback applications.

### So Many Choices

No matter if you're using GNOME or KDE on your Linux install, each has its own default multimedia player. Interestingly, while the desktop interfaces compete with each other, their multimedia players don't. GNOME uses the Totem media player, and KDE defaults multimedia playback with Dragon Player. Totem uses GStreamer directly, but Dragon Player takes a more roundabout path. KDE uses the Phonon multimedia API, which in turn supports GStreamer. Because Dragon Player uses Phonon, it essentially uses GStreamer.

Although these two are the default media players, they are far from the only ones available. In particular, the xine media player (www.xine-project.org) uses the libavcodec library but also has the ability to use Windows codecs. That's because xine has a wrapper that lets it use some Windows libraries to enable playback for some Windows-specific formats.

Two other notable multimedia players are MPlayer (www.mplayerhq.hu) and VLC (www.videolan.org/vlc), both of which are highly regarded and use the libavcodec library. Both have binary versions for Linux, Windows, and MacOS, making either a good choice if you're using lots of computers with different OSes. Instead of teaching different groups of users how to use multiple media players, everybody can be trained to use one.

But although both are cross-platform players, each has its own set of features. MPlayer has the same ability as xine to use Windows libraries to play back certain Windows-only media files. Meanwhile, VLC has the ability to handle incomplete multimedia, letting you watch a file as it downloads. Additionally VLC can read CD/DVD ISO images directly, so you don't even really need a disc in the drive for it to play back the content.

## But Wait, There's More!

MPlayer is a multimedia playback program, but it also comes with a companion program, MEncoder. MEncoder lets you convert from all the formats that MPlayer can handle into a number of other formats. You can also apply a number of effects to the files, including cropping, scaling, letterboxing, and adjusting the frame rate. And because it lets you do all of this from the command line, you can use MEncoder as part of a batch process.

Another project based on libavcodec is FFmpeg. Its goal is different from most of the other projects. It uses the libavcodec library along with other open-source libraries and creates its own for other programs to use. Although it does include a basic multimedia playback program, FFplay, that's not FFmpeg's primary focus. Instead, FFmpeg's chief purpose is directly manipulating multimedia content.

Although this might sound like the same thing that MEncoder does, FFmpeg is a more generalized utility. In particular, MEncoder can be used to manipulate individual multimedia files. However, FFmpeg can be used to handle either audio or video files separately or together. Additionally FFmpeg can work on video or audio streams of individual files. Not surprisingly, a lot of the FFmpeg developers also work with the MPlayer project.

FFmpeg is most popular as an audio and video conversion utility, much like MEncoder is used. But FFmpeg also comes with abilities that you may not expect from a media player or converter. For example, it can capture multimedia streams from any number of sources. If your system has a FireWire/IEEE 1394 or TV capture capabilities, FFmpeg can grab multimedia streams directly off of those ports. FFmpeg also has the ability to record what happens on your screen and redirect it to a file.

Suppose you wanted to create an educational movie that shows users how to do things on a computer. With FFmpeg's screen capture capability, you can perform all the computer-related tasks while using FFmpeg to capture the action. You could then take that captured stream and do any additional editing, like edit out any mistakes or add an audio track, to create the final movie. You can do all of this without a video camera or video capture device to record your actions on a computer.

FFmpeg also comes with FFserver, a multimedia streaming server, something you don't usually find with other media players or converters. FFserver sends multimedia data over the network in a number of ways. In its most basic form, it can send a multimedia file to a Web browser as a regular file. But the real power of FFserver is that it can stream data from another FFmpeg process out to the network.

This gives you all of the FFmpeg's capabilities and adds the ability to send it out over the Internet. So, for example, suppose you wanted to do a live demonstration of a specific computing task. You can tie FFmpeg's screen capture capability with FFserver and do screencasting, all with just the FFmpeg software suite.

If you want a more advanced example of what you can do with just FFmpeg, suppose you had a canned library of existing video intros like what you'd see on TV. You could set up a Web page that asks people for various bits of information about themselves or maybe even let them upload a picture. You could then use FFmpeg to create a multimedia stream based on the data and their image, using the canned video intros. Then you can wrap it up by redirecting the user to an FFserver process that sends the dynamically created video. And you can do all of this without using a video-editing program.

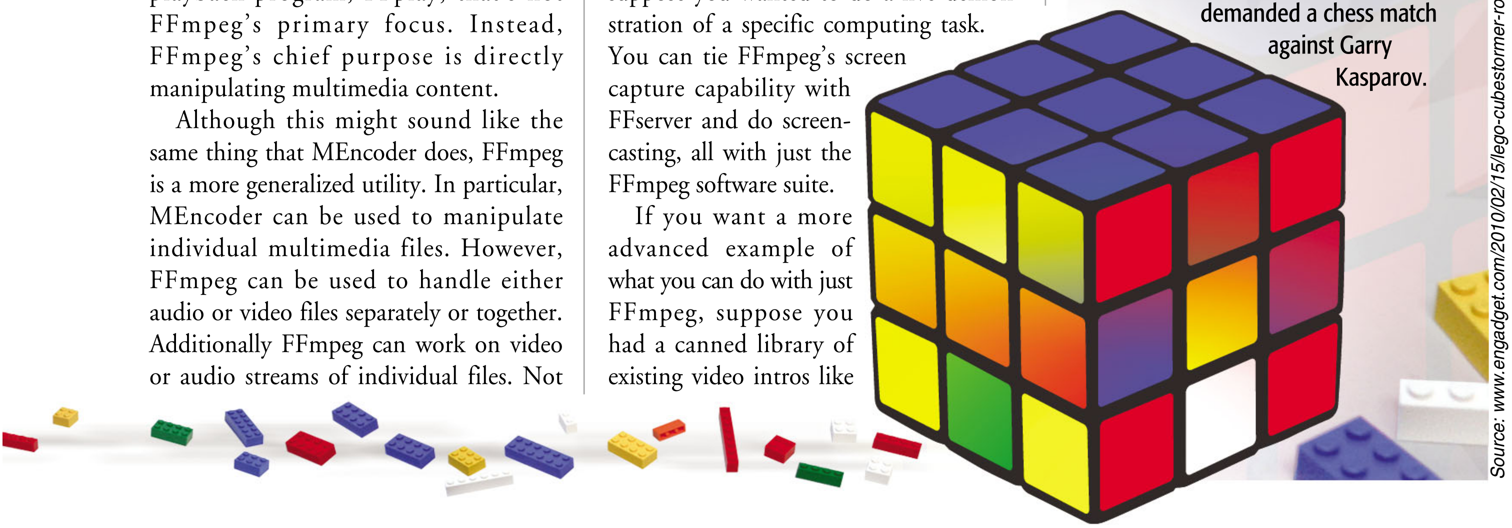
Although Linux was a little behind the curve with regard to handling media files, it's now easily on par with the other operating systems. You can not only play back media files like everybody else, but you also have the ability to manipulate and rebroadcast them. ▲

**by John Jung**

Infinite Loop

## World's Smartest Lego Creation Displays Rubik's Mastery

Humanity can rest easy for now, as Erik Akkersdijk's 7.08-second domination of the Rubik's Cube remains undefeated by a machine, but this Lego Mindstorms contraption is putting on the pressure. Created by RobotSolutions, the CubeStormer raced through a Cube of its own in a tidy 10.75 seconds. Shortly thereafter, it began frothing and demanded a chess match against Garry Kasparov.



Source: www.engadget.com/2010/02/15/lego-cubestormer-robot-solves-rubiks-cube-in-sub-12-second-whir

## Shavings From The Rumour Mill

by Mike Magee

# Heaven Save Us From 1,000 iPad Clones

There's nothing like a bandwagon to excite the PC vendors, and the razzamatazz surrounding the launch of the Apple iPad really has got the manufacturers salivating.

Steve Jobs' firm does a good job of delivering a selection of machines that look really good and occupy their own market niche. But just because Apple may be able to pull it off, like it did with the iPhone, that doesn't necessarily mean that other manufacturers can successfully follow where it leads.

Practically every notebook manufacturer bar Lenovo has plans to try, however. Lenovo has said pretty emphatically that it isn't going to make a slate-style machine; it's done its market research and found, to its surprise, that lots of people just don't want a machine without a keyboard. It doesn't press the right buttons.

Other manufacturers like Dell and HP in a rush to emulate the iPad may just find that they're wasting money, because so far there's no evidence that people will buy the Apple machine. People may even wonder what it's for. If it's a way of reading books and magazines, it's a pretty expensive luxury. Until the price of ereaders comes down by a lot, book publishers may as well go sing for their supper because there just won't be enough critical mass to sell many of their ebooks. And if the reader is expensive, like the Apple iPad, the gizmo will die and be out of warranty and you'll need another, compatible, ereader to look at the ebooks you've already bought.

Microsoft is rumored to have two slate-like reference designs in the works in its labs—of course it does. But the Redmond giant has tried to push tablet PCs before and manufacturers that took the bait got themselves badly burned. There is, of course, a place for tablet PCs: in hospitals and in industrial and niche applications. But the average Joe or Jane, unless they're rich Janes and Joes, aren't going to lash out on an expensive toy when a PC or a notebook is plenty good enough for most purposes.

*Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.*

Sometimes the manufacturers remind me of horses wearing blinkers in a race. They charge along as fast as they can towards what they think will be the winning post but rather than look around and carefully eye up the competition, instead they ignore what's going on around them and end up the losers because of it. It's understandable in a way; if you are in a large company like Dell or Sony, you will do some market research, sure, but you're closeted in and don't necessarily take account of the marketplace because you're involved in the design and marketing of your latest gizmo.

The PC industry is littered with so-called bright ideas that have amounted to nothing while a number of successful concepts have come from nowhere and stolen the show. Text messaging is the perfect example: manufacturers added it to their phones largely as an afterthought, but it ended up being an all-conquering innovation.

And what I don't really understand at all is why the Wintel vendors think that it's cool to copy an Apple idea and think it's going to cut it. Shortly after Apple introduced the iMac, I went to the Computex trade show in Taiwan to find the entire show floor littered with transparent PC cases all in bright shiny colors. Why would you want to have a PC that mimics a Mac? I've even seen people with Apple logos pasted on a notebook to cover the Dell logo. This is not cool. If it's cool to have an iMac, an iPad, or an iPhone, so be it. But it's just pathetic to pretend that you're cool.

So whether all of us out here in the real world want an iPad clone or not, be in no doubt about one thing. There will be plenty of them out there and they'll all flop. And the jury is still out on whether the Apple iPad itself will be the roar-away success that Apple so desires. ▲

---

**Send rumours to "Mad Mike" Magee at mike@cpumag.com**

# Technically Speaking

## An Interview With McAfee's Dave Marcus

Dave Marcus currently serves as security research and communications manager for McAfee Avert Labs. He was formerly senior security strategist for McAfee, with more than 10 years of technical experience in network solutions, information technology security, network performance and integration, and e-learning solutions as well as management and consulting.

**by Barry Brenesal**

**CPU:** Late last year, there was a malware attack that was most publicized for hitting Google. In fact, it targeted more than 30 companies, including Dow Chemical, Yahoo!, and Adobe Systems. These are high-profile, topflight corporations, with a lot of material they want kept secure. How did the malware manage to get in?

**Marcus:** They used a vulnerability that was really only exploitable in IE6, for many technical reasons. Once the vulnerability was exploited, a piece of malware was dropped onto those victimized machines, the goal of which was to steal certain information from that computer or computers on that network. We first started doing analysis on the code that was used in the attack on January 11th. Around about January 14th, we had identified the specific vulnerability in IE that was used.

**CPU:** This was a different kind of attack than most we've seen out there, wasn't it?

**Marcus:** There's a big difference between a targeted attack, and let's say, a spam run. A spam run can have 10 million pieces sent out to a variety of victims, whereas a targeted attack is really focused on a very small group of people, relatively speaking, for very specific information.

Usually a targeted attack like this is something that happens to military computers or the federal government, or something of that high a value. There was reconnaissance involved here, identifying the victims for specific reasons—either for something they had, or something they had access to. In the grand scheme of things, is roughly 30 corporations a big number? Certainly not. But the fact that the malware has been as targeted is certainly significant. This is really the first time that a targeted attack has taken place against 30-plus high-profile business entities.

**CPU:** As for the IPs these attacks took place from (not that you can tell a great deal from that these days, with the many levels of masking that are available), do we think that the attackers were located in the United States, or can we even guess that they might have been overseas?

**Marcus:** You're right, in that you've already identified part of the problem: Knowing the IP address itself really doesn't tell us all that much. Unfortunately, you could launch an attack from someone else's IP address if it's been compromised. But it certainly looks like it's a mix of IP addresses that were in this country and in other parts of the world. It was definitely global in nature, but the actual attack concluded by the end of December, at which point most of the addresses were already offline.

**CPU:** So everything happening now is strictly after the fact. Or was the attack stopped while active?

**Marcus:** I can't really answer that because of the NDAs we have active with some of the victims, but there were technologies in place that were able to stop it on what's known as Zero Day. Then a lot of investigation and human research happened after the fact, analyzing the code, doing the tracebacks, examining the log files, etc. So there were technologies that, depending upon the victim we're discussing, mitigated certain parts of the risk.

**CPU:** This is a vulnerability in IE6, correct?

**Marcus:** Actually, the vulnerability is present in every version of Internet Explorer. But it was only effective on IE6 during the actual attack, because if you're using IE7 or IE8 or running on certain builds of Windows, there's DEP, or Data Execution Prevention, that would have alleviated the actual threat.

**CPU:** This begs the question, why were people in these high-tech, security-sensitive corporations using an older, vulnerability-ridden browser such as IE6?

**Marcus:** It's certainly a valid question why people were running IE6 at a time when certainly more secure and recent builds were available. Enterprise environments are strange things. Some of them take a period of time to roll out and upgrade applications.

**CPU:** Yes, but Google? We're not discussing some technological backwater that still uses punch cards for data entry.

**Marcus:** I hear you. For some organizations, patches have a long tail. Applications don't get upgraded in certain periods of time. Or, if they run applications that have been customized, it may be difficult to upgrade to a new browser; your code only works in an older one. So there are lots of nuances that could contribute to an attacker being successful.

**CPU:** How would you rate the current version of Internet Explorer, IE8, as far as security is concerned?

**Marcus:** I like Microsoft technologies because the company does a very good job of code management. So if you're an enterprise, you know that the second Tuesday of every month, you're going to have to start looking at patch versions and QA processes.

**CPU:** Yet Microsoft has been severely and repeatedly criticized in the past both for ignoring complaints about vulnerabilities until they erupted into major attacks, and for responding sluggishly to demands for patches.

**Marcus:** While there are specific instances where they've been criticized, Microsoft has an established process for dealing with code patches. When a researcher submits a bug, it needs to be put through QA and then prioritized for release. Criticizing them for not releasing a patch update by a specific time doesn't mean they don't have a mature code management process. It comes down to prioritization.

**CPU:** Firefox today is an outsider that's been rapidly moving into prominence in the browser field. We've seen a considerable increase in hackers paying attention to Firefox recently, as well, haven't we?

**Marcus:** That's true. I believe around about the same time as this occurred, we saw a Zero Day on Firefox, as well. Quite frankly, the criminals go where the masses go. That doesn't necessarily mean the technology or browser is better or worse. You've just got to make certain that for the browser you're using, the developers do a good job of code auditing, management, and patching.

**CPU:** With corporate customers now running a mix of Windows XP, Vista, and Windows 7, what are the security recommendations you would make to them?

**Marcus:** You've really got to look at layers, and I think that's never been truer than now. Safe browsing technologies are important, and I think enterprises probably should start looking at whitelisting, too, quite honestly. I also think you're going to start seeing a lot of reputational technologies become very popular on networks in the corporate space.

**CPU:** What do you mean by reputational technologies?

**Marcus:** We have a way of reputationally looking at IP addresses, mail traffic, and Web traffic. What I mean by that is an IP address may have a history attached to it. So we might have seen a certain type of traffic from a given IP address over time; this will give it a reputation rating, sort of like a credit score. If you're using the technologies that consume those reputations, you can drop traffic, or even refuse traffic from Web sites or addresses that have bad reputations.

**CPU:** When you were speaking of whitelists before, that struck me as being the essence of a bunker mentality. After all, blacklisting assumes the world is good, and there are a few criminals out there. Whitelisting assumes you're in the middle of a war. Am I correct?

**Marcus:** That's a very apt analogy, I think, but let me give you a number that we deal with on a daily basis: 50,000. That's potential different pieces of malware, every single day. When you're running an enterprise environment, you're going to run a certain percentage of applications, probably Microsoft Office, a browser, and perhaps one or two other programs throughout your network. If it's a corporate asset, and you're looking to manage the risk on that corporate asset that's only supposed to be used for business purposes, whitelisting makes perfect sense. It's just limiting the exposure plane. In this day and age, there's a lot of malware out there that targets businesses.

Mind you, in a consumer world, for home PCs, there's a different argument. You're using your computer for entertainment, and whitelisting may not be appropriate. Because, as you state, it's

> Enterprise environments are strange things. Some of them take a period of time to roll out and upgrade applications.
>
> —Dave Marcus

like using a lock-down bunker. Whitelisting is, however, very useful in a corporate environment.

**CPU:** From what you've seen in developments on the malware front over the last year, what changes do companies and home users need to be most aware of?

**Marcus:** I would say they all really need to understand several things. The first is headlining. It's an amazing phenomenon. One of the things we observed throughout 2009 was news headlines used almost the same day of their issue within spams or scams. A good example would be the economic downturn. As soon as this occurred, we started seeing a lot of spams and scams that employed the same verbiage from the news, as the lure leading to a link, which then installed malware. That became hugely popular over the last year, though a lot of people never realized this. Criminals read the same news we do, after all.

The other thing I think people need to realize is just the sheer volume of Web-based malware you see in this day and age. I don't say that to frighten people to avoid browsing. It's just that we see a lot of malware that originates through browsers today. So I think computer users need to look at browsing technologies like Site Advisor that can tell you if a Web site is good. This also applies to antiphishing technologies, so that you can surf with confidence.

**CPU:** Those browsers we were discussing earlier do include some built-in antiphishing technology.

**Marcus:** That's one of the areas where I think some of the browser companies have really stepped their game up, by including a certain level of security technology within their products.

**CPU:** Are there any new virus technologies that we need to be aware of? Any old ones making a comeback?

**Marcus:** Interestingly enough, parasitic and polymorphic malware have come back, thanks to pluggable storage devices. Most of these were dead for a long time.

**CPU:** How do these work?

**Marcus:** When you think back to the parasitical viruses that were designed to copy themselves from file to file, those ceased to be popular as the network environment became more prevalent. A virus didn't need to copy or append itself into a file to live, especially when the criminals started concentrating on money instead of just on infection. When the focus became profit, then they started producing Trojans: Drop something onto the machine, let it gather some information, and then have it send the stolen information to another machine.

But parasitic malware is designed to live, and replicate itself. It works out really well with the technology of a pluggable, portable storage device, because then the malware can be easily copied from machine to machine to machine. They're called Autorun worms. These rely upon two things: the actual, portable device itself and Windows Autorunning plug-ins. They require that functionality to copy themselves into the new computer.

**CPU:** Are these Autorun worms intentionally destructive, or just information gatherers?

**Marcus:** They're a little bit of both. The problem you run into with parasitic and polymorphic malware is that it's a lot more complex than the usual kind. If it doesn't work right, generally it tends to crash computers, because if it's not coded correctly, makes the wrong call, doesn't copy itself into a file correctly, you get a Blue Screen of Death. But a lot of the functionality—meaning, what it's actually gathering—is much the same as the other types of malware: looking for data, to copy a file off to a remote server, etc. It just wants to live a little bit longer, through replication.

**CPU:** The idea of surreptitiously copying data from one computer to another has been almost a theme in this interview. What sort of information is usually stolen in this way?

**Marcus:** In a general sense, they're targeting identity information, whether it's a credit card, Social Security number, password file, or a hook into your browser to capture your session when you log in to your bank account. It wants information that relates to the paying of bills, or something along those lines.

**CPU:** So how do you avoid putting that kind of data on your computer?

**Marcus:** I don't know that in this day and age you can actually get around doing so. If you keep credit card information on your computer or you do a lot of online purchasing, you should probably have it password-protected and encrypted. I think that's always a good idea. Then just make sure you're staying up-to-date. A lot of people don't really take that to heart that their computers should update and scan on a daily basis. If they absorb that piece of information, it will save them a lot of trouble in the future. CPU

> Interestingly enough, parasitic and polymorphic malware have come back, thanks to pluggable storage devices.
> —Dave Marcus

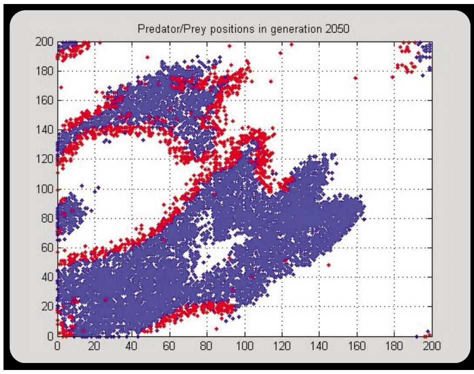
by Anastasia Poland

# Under Development

## A Peek At What's Brewing In The Laboratory

### New Sim Adds Fast-Forward Button To Evolution

You've done your fair share of SimLife gaming over the years—you know, just a few hundred hours exploring alterna-worlds with your mad biologist hat on. Robin Gras, an associate professor of computer sciences at Canada's University of Windsor, understands that sim love and has created a program to study theoretical biology that out-Sims any game experience you've had.



University of Windsor's Dr. Robin Gras' software illustrates evolution, speciation, and complex behaviors for both predator (red dots) and prey (blue dots) over millions of years in a matter of days.

Gras says, "Our global aim was to develop a generic platform able to simulate complex ecosystems with 'intelligent' agents interacting and evolving in a large and dynamic environment. For that, we have chosen to use an individual-based model and to implement the predator-prey paradigm."

A user can study the "agents" (or animals) as they evolve over millions of years in the virtual world and can easily toggle back and forth through the world to check out exactly when, how, and why the species changes or goes extinct. The creatures' behavior is informed by what he calls "a fuzzy cognitive map," or FCM, which represents internal states such as emotions, desires, and memory over a period of time. These internal states can influence the agents' actions.

"As such," Gras explains, "[FCMs] allow for the building of agents that are able to perceive, to make a decision, and to act. This enables an agent to evaluate (with memory) its environment (e.g. its distance to food or a possible mate or its energy level) and internal state (e.g. fear, hunger, or curiosity) and [then] choose among several possible actions (e.g. escaping, eating, or breeding)."

What's extra cool about this program is that it not only lets the user study the evolution of the creatures but also allows for speciation (formation of a new and distinct species) to emerge based on the animals' behaviors. "To date, there is no large-scale, individual-based ecosystem simulation that integrates a complex behavioral model for the agents, an evolutionary mechanism, and a speciation mechanism," Gras says.

Still in the development phase, the program's graphics have yet to be created, so predators are displayed as red dots, while prey are blue dots. The software will run on any computer. ▲

### MultiLearn Maximizes Resources To Serve Students

Many of us in developed nations think nothing of having at least one computer in our homes, if not more. This isn't true for the rest of the world; computer sharing is common, especially in schools. That said, computer sharing isn't the most efficient way to learn, as researchers at the University of Washington's computer science department, in conjunction with Microsoft Research India and the Azim Premji Foundation of India, have discovered. And to solve the issue, the undergraduate researchers Sunil Garg, Clint Tseng, and Heather Underwood found that splitting the screen and offering multiple keypads offered a whole new learning resource for students.

Based on prior work by their advisor, professor Joyojeet Pal, with multiple mice for one computer (dubbed "MultiPoint"), the students used hardware and software that are easy to access (using Microsoft Windows and replacing the mice with standard USB numeric keypads) to develop their program, which they have called "MultiLearn." With a screen divided into four columns, one for each keypad, MultiLearn offers randomly generated spelling or math problems that increase in difficulty based on the user's performance. The program also offers a "teacher's dashboard" that tracks and stores each child's performance for later review.

Pal is enthusiastic about his students' work, noting some of their standout concepts. "Personally I would say that our idea of adaptive questioning was a very important innovation," he says. "While we've been floating around the idea of adaptive questioning for a while, it was harder to implement for language or scientific learning applications, [but] in comparison, much easier with math. I'd say using numeric keypads instead of mice was the first major innovation, and the adaptive learning was the second." ▲

MultiLearn software, accompanied by multiple USB keypads, lets four students use a single PC for math and language drills. (Credit: University of Washington)

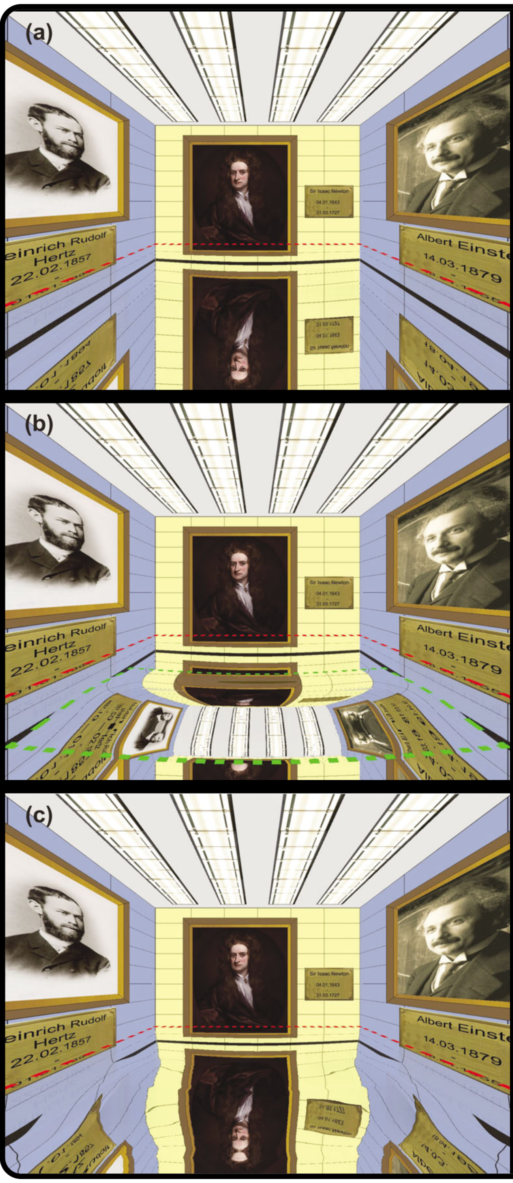
# New Software Lights The Way For Metamaterials Engineers

Invisibility cloaks—the stuff of fantasy and science fiction or a possibility in this world? Although research in creating invisibility cloaks has rendered only microscopic successes, a computer-enabled visualization tool that illustrates optical cloaking, created by a group of scientists at the Karlsruhe Institute of Technology in Germany, will now enable those working in the field to "see" what they are theoretically designing. Jad C. Halimeh wrote and put the software through its paces at the Institute.

Halimeh's visualization tool is able to create photorealistic representations of how metamaterials (specially engineered materials that offer properties not known in nature) may perform in a particular environment. Specifically, in this case, the software works with metamaterials that deal with transmitting light in unusual ways, such as being utilized in optical cloaking.

To illustrate the software's capabilities, Halimeh and his colleagues created a virtual three-sided museum including a ceiling, wall-hanging art, and a reflective floor. In the midst of the floor, they placed an "object" and covered it with what they call a carpet cloak. A user can see abnormalities in the reflective floor around the bump, as it would be assumed that the carpet cloak would reflect light unevenly and show blemishes in the "fabric." The program will run on any laptop or PC.

According to Halimeh, the software is still in the research-and-development phase in order to tackle more complex media. ▲



Jad C. Halimeh and colleagues at the Karlsruhe Institute of Technology in Germany have created a software visualization tool to help metamaterial designers visually analyze the practical applications of their optical developments.

# Worm Gene Data Flags Environmental Toxicity

Someday, the research being done on nematodes and earthworms at the School of Biomedical & Health Sciences at King's College, London just may save us from environmental toxic overload. The project, led by Dr. Stephen Sturzenbaum, is investigating how the genes in these creatures are being affected by such chemicals as atrazine (an herbicide), aldicarb (an insecticide), and fluoranthene (used in dyes, pharmaceuticals, and agrochemicals), along with heavy metals such as copper, cadmium, and lead. The researchers are using the nematode as a model for human disease and the earthworm as a model to assess environmental fitness in their microarray experiments, says Sturzenbaum.

The work isn't easy for Sturzenbaum and his team. The sheer volume of data that they need to process to find any pattern or disruption in their subjects' biology is boggling. The team uses Affymetrix gene chips (see "Under Development" in the February 2009 issue on page 106 for more information) that contain the entire spectrum of a nematode's genes and partial sets of an earthworm's. (The gene sets are printed onto the chip.) The DNA of exposed worms is fluorescently labeled and washed over the chips to yield a quantitative output of gene expression.

Sturzenbaum estimates that each assay can deliver "100,000 or more data points," enough to make even the most dedicated scientist bleary. He found his solution in Qlucore, a 3D modeling software (developed by Dr. Thoas Fioretos of Sweden's Lund University) that reduces the analysis of data from weeks or months to mere hours or days. Qlucore lets the researchers visualize data in 3D and find hidden trends in real time, something no other gene modeling software has done. ▲

**REVOLUTION PC LLC**

859-305-0779 | www.revolutionpc.net

## Systems starting at $800 with operating system

### DESTROYER
**Gaming Desktop PC**

- Intel Core i7-920 2.66Ghz Quad Core Processor
- Hyperthreaded
- Automatic Self-Overclocking (Intel Turbo Boost)
- Asus P6T Gaming Motherboard
- Intel X58/ICH10R Chipset

### Hornet
**X58 Gaming PC**

- Foxconn FlamingBlade Socket 1366 Core™ i7/ Core™ i7 Extreme Intel X58 ATX Motherboard
- Intel Core i7 920 2.66 GHz QPI 4.8 GT/s Socket 1366 Processor
- Antec Basiq BP500U 500W PS2 Power Supply
- Western Digital Caviar® SE 500GB SATA 3.5 inches Hard Drive

### WARRIOR
**GAMING PC**

- Cooler Master Stacker 830 painted by Smooth Creations
- ASUS P6T LGA 1366 Intel X58 ATX Intel Motherboard
- Intel Core i7 920 processor
- 6GB Corsair Tri Channel PC 12800 DDR3 Memory
- Seagate Barracuda 7200.11 1.5 Terrabyte Hard Drive

intel CORE i7 inside

**i7 X58**

**CUSTOM BUILT PCs**

**3 YEAR WARRANTY**

**24/7 TECH SUPPORT**

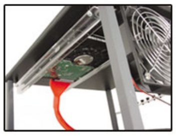
---

# HighSpeed PC
**Specialty Comupter Hardware**

## HSPC Tech Station Fast-Access Computer Case!

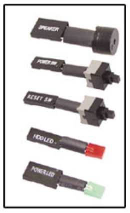
"The Tech Station (patent pending) is a hardware workbench bringing PC parts within easy reach yet keeping them safe and secure. Perfect for PC builders, upgraders, and overclockers."

- New! Secure rubberized motherboard standoffs
- HDD storage/cooling rails for up to two 3.5" hard drives
- AGP/PCI card supports brace w/ thumb screws (no loose add-in cards!)
- ATX Control Kit (mini power/reset switches, LEDs, speaker)
- 120mm fan for ideal cooling
- Anti-static and non-conductive!
- Standard, Large, and Custom sizes/colors available



Hard Drive Storage Rails

AGP/PCI Support Brace



ATX Control Kit

**www.highspeedpc.com**

---

## STILL TESTING ONE PC AT A TIME?

**IDEAL SOLUTION FOR:**

- SYSTEM BUILDERS
- COMPUTER REPAIR SHOPS
- RECYCLING CENTERS
- MOBILE ONSITE TECHNICIANS

FULLY INDEPENDENT DIAGNOSTIC NETWORK APPLIANCE

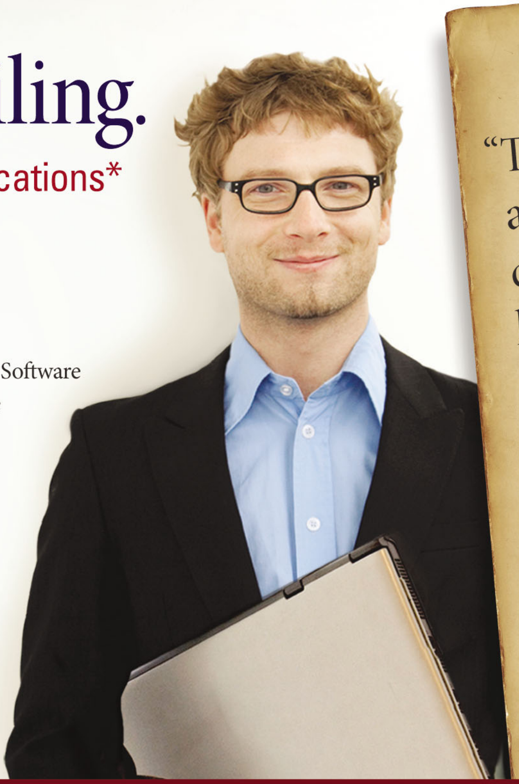
INCREASE BUSINESS VOLUME / PROFIT WITH REDUCED MANUAL LABOR

SINGLE SOLUTION FOR TESTING ANY DESKTOP, LAPTOP OR SERVER PC

ULTRA-X, INC.

**INFO: 1-888-722-3734**

WWW.UXD.COM



Why he's smiling.

He has a degree ***and*** certifications*
and the IT job he wanted.

Respected online degrees:

- BS in IT, Networks, Security, Databases, or Software
- MS in Information Security and Assurance
- MBA in IT Management

*Certifications included at no extra cost

Call Toll Free
888-279-4571
or visit us at www.wgu.edu/time12

"The best—
and cheapest—
college you've never
heard of is found
only online"

—TIME magazine, November 17, 2008

TIME

WESTERN GOVERNORS UNIVERSITY
ONLINE. ACCELERATED. AFFORDABLE. ACCREDITED.

2008 USDLA 21st Century Distance Learning Award

WGU is honored to receive the USDLA 21st Century Award for Best Practices in Distance Learning for 2008.

Ascend!

CPU REVIEW ●●●●○ 4 out of 5

10 PCI
XL-ATX
Ready!!

ELEVATE YOUR COMPUTER EXPERIENCE

Mountain Mods - Ascension

503.631.7797
WWW.MOUNTAINMODS.COM

Plug into *Computer Power User*
for all the latest and greatest in the world
of enthusiast-level computing.

☒ We have Modding
☒ We have Hardware
☒ We have Reviews
☒ We have Industry leaders

Log onto www.computerpoweruser.com
and try 3 issues RISK-FREE today!

# Look For *CPU* At These LAN Parties Across The Nation—& Beyond!

### 03.12.10
Intel LANFest - Dallas - Winter 2010 - Dallas, TX
lanfest.intel.com
LAN Fest Portland - Portland, OR
lanfest.intel.com
Madicon LAN Party - Harrisonburg, VA
www.madicon.org
MegaCon - Orlando, FL
www.megaconvention.com/view/gaming
Flatout LAN - Marysville, CA
forcerun.frih.net

### 03.13.10
CapLAN - North Vancouver, BC, Canada
caplan-bc.com
LAN Lordz 73 - Wichita, KS
lanlordz.net
LAXLAN - Los Angeles, CA
www.laxlan.com
Peace, Love, and Rockets 16 - Arlington, TX
www.peaceloveandrockets.org
PLAN XIII - Kalamazoo, MI
whatistheplan.com

### 03.15.10
LANKnights - Orlando, FL
www.lanknights.net

### 03.17.10
Phara-Con - Houston, TX
www.mazianni.com

### 03.19.10
Overkill LAN Party - Tampa, FL
www.overkill-lan.com

### 03.20.10
Network of Gamers - Whitewater, WI
www.networkofgamers.org
NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com
Oklahoma Gamers Group - Oklahoma City, OK
www.okgg.org
SLAGG - Sarasota, FL
www.slagg.org
St. Cloud Gamers - St. Cloud, MN
www.StCloudGamers.com

### 03.26.10
Central Ohio LAN - Enon, OH
centralohiolan.com
Iron Storm 11 - Castle Shannon, PA
www.pittco.org
Juggernaut LAN - Hillsboro, OR
www.juggernautlan.com
LAN@NIU - DeKalbe, IL
niulan.forumakers.com
PAX East - Boston, MA
www.paxsite.com

### 03.27.10
MadChinchilla LAN Party - Lincoln, CA
www.gamercorps.com
WVG Gamers - Eugene, OR
www.wvgamers.com

### 04.02.10
Panhandle Gamers V.14 @ University of West Florida - Pensacola, FL
www.panhandlegamers.com

### 04.03.10
LANManiac - Brea, CA
www.lanmaniac.com

### 04.10.10
Gaming Northwest LAN 4 - Vancouver, WA
www.gamingnw.com
LANime Spring 2010 - Binghamton, NY
www.binggaminggroup.org
LAN Lordz - Wichita, KS
lanlordz.net
SLAGG - Sarasota, FL
www.slagg.org

### 04.15.10
LANKnights - Orlando, FL
www.lanknights.net

### 04.16.10
CarolinaCON - Greensboro, NC
www.ncgaming.com
FragFest X - Utica, NY
gamers.sunyit.edu
Project X: Uprising! - Calgary, AB, Canada
www.projectxLAN.com

### 04.17.10
East NC Gamers - Greenville, NC
games.groups.yahoo.com/group/EastNCGamers
LAN OC 6.0 - Ohio City, OH
lanoc.org
OnTargetLan April 2010 - Hot Springs, AR
www.ontargetlan.com
NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com

### 04.24.10
WVG Gamers - Eugene, OR
www.wvgamers.com

### 05.01.10
LANManiac - Brea, CA
www.lanmaniac.com
Peace, Love, and Rockets 17 - Arlington TX
www.peaceloveandrockets.org

### 05.02.10
Voodoo Fundraiser - Prophetstown, IL
www.voodooproductionz.com

### 05.07.10
BaseLAN - Winnipeg, Manitoba
www.allyourbaseonline.com

### 05.08.10
LAN Lordz - Wichita, KS
lanlordz.net
SLAGG - Sarasota, FL
www.slagg.org

### 05.15.10
NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com

### 05.22.10
WVG Gamers - Eugene, OR
www.wvgamers.com

### 05.28.10
LAN69 Version 2.0 - Lockport, NY
www.lan69.com
PowersGaming Memorial Day LAN - Austin, TX
www.powersgaming.com

### 06.05.10
LANManiac - Brea, CA
www.lanmaniac.com

### 06.12.10
LAN Lordz - Wichita, KS
lanlordz.net

### 06.19.10
NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com
WVG Gamers - Eugene, OR
www.wvgamers.com

### 06.26.10
Meno Falls LAN - Pewaukee, WI
www.menofallslan.com

### 07.01.10
ClanUSEast 2010 - Laughlintown, PA
www.clanuseast.com

### 07.09.10
Massive LAN - Hamburg, NY
www.massivelan.com

### 07.10.10
LAN Lordz - Wichita, KS
lanlordz.net
Peace, Love, and Rockets 18 - Arlington TX
www.peaceloveandrockets.org

### 07.16.10
SGXLAN - Jacksonville, FL
www.sgxlan.com

### 07.17.10
NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com

### 08.14.10
LAN Lordz - Wichita, KS
lanlordz.net

### 08.21.10
NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com

### 09.11.10
LAN Lordz - Wichita, KS
lanlordz.net

### 09.18.10
NGC's LAN-A-GEDDON - Greenville, TX
www.networkgamingclub.com

### 10.09.10
LAN Lordz - Wichita, KS
lanlordz.net

### 10.16.10
TigerLAN 22 - Hays, KS
tigerlan.net

For our full list of upcoming events, visit the *CPU* LAN Yard page at www.computerpoweruser.com/LanYard.

## Would you like us to help promote your next LAN?

Give us a call at 1.800.733.3809 or visit our LAN Yard site at www.computerpoweruser.com/LanYard to input your own information and see your LAN party name in our upcoming issues.

## We'll be glad to consider your event!

*Processor* is the industry's most comprehensive source for:

- Snapshots of new data center and **IT hardware and software**
- Rundowns of **major industry news**
- Information on **manufacturers** and **resellers**
- **Tips**, **strategies**, and **advice** from experts in the field

*Processor*. Another great resource from the publishers of *CPU* magazine. Learn more at Processor.com

Visit **www.Processor.com** or call **(800) 819-9014** to sign up for your complimentary subscription.

PROCESSOR

# Q&A With Greg Nielson

## Sandia Labs' Lead Researcher's Sunny Disposition

*You can die from dehydration quite easily in the middle of an ocean. Perhaps that's how it feels at Sandia National Laboratories in Albuquerque, N.M., where researchers in the solar group try to figure out how to harvest more photons for electricity while surrounded by seemingly endless, bright sunshine. The tech industry is awash in "green" messaging, but even the best of these efforts only scratches at the underlying energy problems. Yet imagine if our systems, cars, portable devices—our entire world—could be powered from the Sun. Sandia lead researcher Greg Nielson thinks he's taken us one step closer to making that a reality.*

Q **What drew you to photovoltaics? Was it glory, girls, or grant money?**

GN (*Laughs*) That's an interesting question. Shortly after I got here, I came up with an idea for a MEMS (microelectromechanical systems) device you could shine an incoherent light on, like sunlight, and get a mechanical resonance out of it—an alternative to the photovoltaic effect. You could build MEMS structures to harvest energy from the sun from the mechanical to the electrical domain, either through a piezoelectric or a capacitance interaction.

That research led to discussions about where the expensive spots in PV solar components lie and how you can go about reducing costs. Out of those discussions came what we're calling glitter, these little thin crystalline-silicon PV cells that measure . . . only one-quarter of a millimeter in diameter.

I'm trying to take technologies from MEMS as well as IC design and fabrication and move them into PV. By doing that, we think we can reduce costs and achieve greater relative efficiency.

Q **Efficiency is one of the key reasons solar has had such a hard time getting off the ground up until now, right?**

GN Researchers have shown PV efficiencies up to 40% or more, but the modules you buy are typically around 15%, because increasing efficiency above 15% costs more and more money. So far, we've shown cells that were 15% efficient, but we expect to go higher. We're making the crystalline material work a lot harder, using it more efficiently.

Q **I recently tested a $50 solar battery charger. It took all day in bright sunlight to charge *one pair* of AA batteries. That seems absurd.**

GN You can buy a backpack with PV built into it to charge a cell phone or whatever, but the PV is about 4% to 5% efficient—really poor. You're looking at about $40 per watt at peak production under the brightest sunlight. Building stuff on a flexible substrate is really hard to do in a way that's robust, but we think we have a way to do flexible photovoltaics at much higher efficiencies. Right now, we could do that with our cells at even 15% efficiency. But silicon has been demonstrated to be over 25% efficient, so if we could get into that range, we could increase the power output of those electronics—charging bags and things—by a factor of five.

Now, on the rooftop solar power side, we also think we can have a big impact. One particular reason is the fact that we're using much less silicon to produce the same amount of power. For cells and modules, silicon is definitely the biggest cost driver. But in our case, that cost essentially goes away because we're reducing the silicon by a factor of like 100.

Q **Is there a way to quantify the resource footprint of glitter PV vs. other energy production means?**

GN In terms of photovoltaics, various companies claim that the energy payback period, how long it takes the modules to pay back the energy it took to build them, for solar modules is something like 18 months to two years. Now, if you figure that even half of that is due to the silicon, and we reduce the amount of silicon by a factor of 100, then the energy payback period might go down . . . to perhaps nine to 12 months. The lifetime of solar panels is pretty good—20 to 25 years or more. You get 10X or more energy out of them than you put into making them.

Q **So how much of this big-picture energy problem can solar possibly solve?**

GN As far as the solar resource compared to other renewable energy sources, it's by far the greatest. In time, it certainly could replace oil, coal—practically everything. ▲

**For bonus content, subscribers can go to www.cpumag.com/cpuapr10/Nielson.**

THE ULTIMATE COOLING SOLUTIONS

BUILT-IN LIQUID COOLING SYSTEM PRE-INSTALLED

SIM HARDWARE AND SOFTWARE - 6 CHS OF INDEPENDENT THERMAL READING AND TUNNING

REMOVABLE MAIN BOARD TRAY FOR EASY INSTALLATION

SUPPORT THE LATEST CPU SOCKET TYPE

RIGID AND LIGHT WEIGHT ALUMINUM STRUCTURE

STATE OF THE ART PC CHASSIS

UNIVERSAL CPU SOCKET

LIQUID COOLING SYSTEM

WWW.ELOGISYS.COM

IKONIK™ BY LOGISYS

CORSAIR®
corsair.com

# *Sometimes, to do it right, you have to do it yourself...*

## The
## OBSIDIAN SERIES™ 800D

The Obsidian Series 800D is a revolutionary, ground-up endeavour that's quite possibly unlike any PC chassis you've ever seen. It's built to last through years of motherboard and component upgrades, and incorporates dozens of advanced features designed for extreme flexibility and ease of use. That's why the award-winning Obsidian Series 800D has quickly become the favorite of performance system builders and case modders around the world.

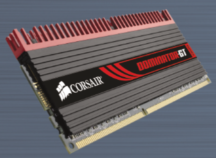
The tool-free design allows for quick entry and access. Inside, you'll find isolated cooling zones that prevent heat buildup. Four hot-swap drive bays are within easy reach. And a unique routing system eliminates the cable clutter that can impede airflow.

The Obsidian Series 800D is backed by a two-year warranty and Corsair's world-class customer service and technical support. If you've already built dozens of machines or if you're doing it yourself for the first time... do it right and make the 800D the cornerstone of your system.

**Learn more at corsair.com**

**Corsair offers a complete line of enthusiast-grade components and accessories.**

MEMORY



DOMINATOR® GT

COOLING

CORSAIR COOLING™
HYDRO SERIES H50

POWER SUPPLY

PROFESSIONAL SERIES
HX850W POWER SUPPLY

SOLID-STATE DRIVES

PERFORMANCE SERIES™
P256

FLASH DRIVES

FLASH SURVIVOR™ GT